Sampling Plan

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Pre-Design Investigation Delaware Sand and Gravel Superfund Site (Phase II) New Castle, Delaware

Prepared for:

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska
Contract No. DACW 45-89-C-0518

Acting for:

U.S. Environmental Protection Agency
Region III
Philadelphia, Pennsylvania

Prepared by:

URS Consultants, Inc.
Buffalo, NY

DECEMBER 1989
REVISION I APRIL 1990
REVISION II DECEMBER 1990

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PRE-DESIGN INVESTIGATION (PHASE II)

DELAWARE SAND AND GRAVEL SUPERFUND SITE

NEW CASTLE, DELAWARE

Contract No. DACW 45-89-C-0518

A-E SITE SAMPLING PLAN

DECEMBER 1989

REVISION I APRIL 1990

REVISION II DECEMBER 1990

DEPARTMENT OF THE ARMY

OMAHA DISTRICT, CORPS OF ENGINEERS

Prepared By:

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1.0 PROJECT DESCRIPTION

1.1 Purpose and Scope

The U.S. Army Corps of Engineers (USACE), Omaha District, has contracted with URS Consultants, Inc. (URS), to perform engineering services for pre-design activities at the Delaware Sand and Gravel Superfund Site in New Castle, Delaware (hereinafter referred to as the site). URS services will be performed under contract number DACW 45-89-C-0518.

The objectives of this project are to define the horizontal and vertical extent of contamination within the Drum Disposal and Ridge areas, and to conduct a thermal treatability study to assess the capability of incineration for treating site-specific soil and waste in compliance with the Record-of-Decision.

Field work will involve the following sampling and investigative activities:

- o Test trenching to define condition of waste
- o Drilling for waste/soil samples for physical/chemical testing
- o Compatibility testing and contaminant pre-screening of contaminated soil/waste samples using onsite laboratory facilities

The drilling and trenching at the site will be carried out in accordance with applicable permit and licensing requirements. Chemical analysis will be performed by a USACE-approved laboratory.

Plans developed concurrently with this field sampling plan are as follows:

- o A-E Laboratory Quality Management Plan (A-E LQMP)

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- A-E Quality Control Plan (A-E QCP)
- A-E Safety and Emergency Response Plan (A-E SHERP)
- Treatability Testing Study Work Plan
- A-E Report Format Plan

These plans were developed in accordance with special plan instructions as provided in the USACE 'Scope of Services - Appendix A' and 'Supplement to Appendix A', dated June 1, 1989.

1.2 Site Description

The following site description has been derived from the Remedial Investigation Report prepared by Dunn Geoscience in December 1987 for the Delaware Sand and Gravel Superfund site.

The Delaware Sand and Gravel Superfund site is located approximately two miles southwest of New Castle, Delaware, west of State Route 9, on Grantham Lane (Figure 1-1). The site is approximately 27 acres in size.

The area surrounding the site includes Army Creek (a tributary to the Delaware River) to the west, Army Creek and wetland area to the north, residential and business facilities to the east, and an abandoned sand and gravel quarry to the south. Also to the west of the site, directly across Army Creek, lies the Army Creek Landfill, an inactive municipal landfill currently on the National Priorities List.

Wastes were deposited in four areas on the property. These areas are referred to as the Drum Disposal, Inert Disposal, Ridge, and Grantham South Areas. The Drum Disposal Area is located in the northern part of the property and occupies about three quarters of an acre. The Inert Disposal Area is located in the southern part of the property and occupies approximately 10 acres. The Ridge Area occupies an approximately half-acre strip along the gravel road on the western boundary of the property. The Grantham South Area is located south of the inert area, occupying

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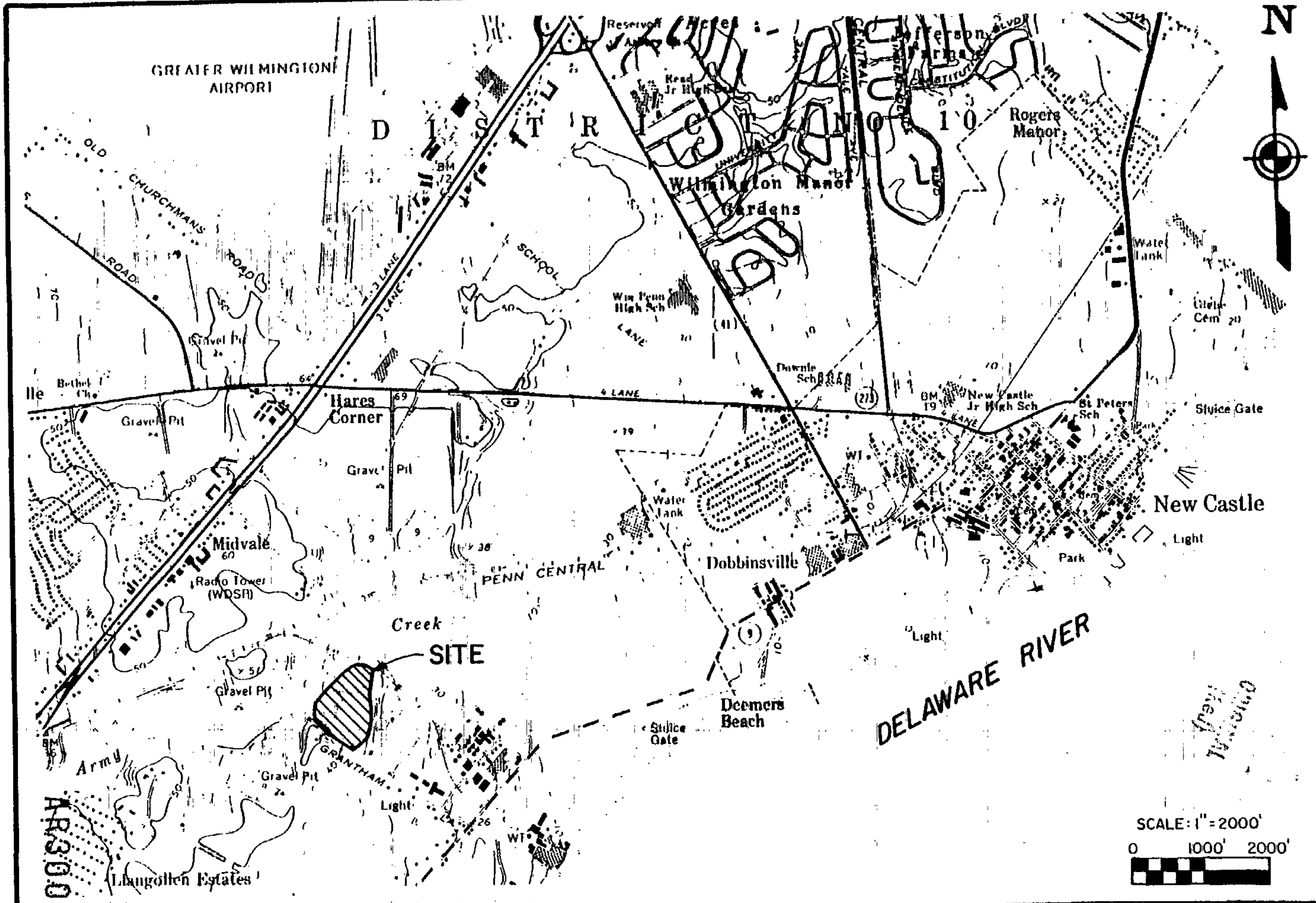

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DELAWARE SAND & GRAVEL
VICINITY MAP

FIGURE 1-1

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about 1.3 acres. Waste disposal activity is not believed to have occurred in the remaining 14.5 acres. This contract is limited to the investigation of the Drum Disposal Area and Ridge Area portions of the property.

The site was formerly operated as a sand and gravel quarry. On September 9, 1968, a Certificate of Approval for a sanitary landfill was granted to Delaware Sand and Gravel Company by the Delaware Water and Air Resources Commission. The facility's Air Pollution Control Permit allowed the disposal of cardboard, wire, pallets, corkdust, and styrofoam.

In 1970, the site was granted a Delaware State Sanitary Corps permit. A Solid Waste Disposal Permit issued by the Delaware Department of Natural Resources and Environmental Control (DNREC) was in effect from 1971 until 1976. During June 1975, DNREC inspected the site and installed monitoring wells. Upon noting improper operating procedures, including poor cover and compaction, the Department took enforcement action. The Delaware Sand and Gravel Company declared bankruptcy in 1976 when DNREC filed enforcement action. A remedial investigation and feasibility study (RI/FS) was subsequently conducted for the State of Delaware, Department of Natural Resources and Environmental Control, by Dunn Geoscience Corporation. The RI was completed in December 1987 and the FS in February 1988.

The DS&G site was therefore operated as a permitted industrial landfill from 1968 to 1976, reportedly accepting 48,000 cubic yards of inert waste yearly on a 24-hour-per-day basis. Dumping of wastes, however, may have begun as early as 1961, and disposal of household and construction wastes has been reported to continue through 1987. Additionally, 7,000 drums containing industrial liquids and sludges from perfume, plastic, paint, and petroleum refining processes were reportedly disposed of in the Drum Disposal area in a pit approximately 150 x 70 x 15 feet in size. Dumping of liquid industrial waste officially ceased in October 1969.

1.3 Site Geology

Geologically, DS&G lies within the Atlantic Coastal Plain physiographic province. The coastal plain is a stratified, seaward-thickening wedge of unconsolidated and semi-consolidated sands, silts, clays, and gravels deposited atop a seaward-sloping complex of crystalline basement rock. In the Army Creek area, the Quaternary (Pleistocene) Columbia Formation occurs as a veneer over the seaward-dipping Cretaceous-aged Potomac Formation. Quaternary (Recent) alluvial deposits occupy current streams and tidal marshes. Depths to bedrock range from 400 to 650 feet below land surface.

The contact between the Quaternary (Columbia) sediments and the Potomac Formation is an erosional and angular unconformity. Usually, a dense red clay marks this contact. This clay (the uppermost Potomac confining clay) is believed to be absent in two areas: one at the subcrop/recharge zone for the Upper Potomac Hydrologic Zone, about one mile northwest of DS&G, and the other, between the Army Creek Landfill and DS&G, as a small hole or window called the zero area. This window is the likely pathway for contaminants entering the Upper Potomac Hydrologic Zone, which is the primary aquifer of concern in the area.

Results of the Remedial Investigation indicate that the Columbia Formation is relatively dry beneath much of the Delaware Sand and Gravel site. The groundwater within the Columbia is derived from infiltration of rain water, infiltration from Army Creek, and infiltration from the drainage ditch east of the site. As such, water in the Columbia at the site moves vertically downward under unsaturated conditions until it encounters the uppermost Potomac clay. Water encountering the Uppermost Potomac clay may build up to a depth of a few feet, creating a saturated thickness in some locations. Beneath the site, this perched groundwater moves laterally on top of the clay to discharge through the zero area into the Upper Potomac Hydrologic Zone.

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1.4 Contaminants of Concern

The following is a summary of the extent to which surface soils and formation soils, are contaminated at the site.

Surficial Soils

The analytical results for surficial soils on the Ridge Area indicate isolated "hot spots" with significant concentrations of organics and metals. Metals detected above background included arsenic, antimony, barium, copper and lead. The major organic detected was PCB's at concentrations from 97 ppb to 49,000 ppb.

Surficial soil contamination is not a concern at the Drum Disposal Area because of the USEPA cleanup action in 1984 which removed surface drums, and covered and revegetated the area.

Formation Soils

The analytical data for deep soil samples indicate that organic and metal contamination is emanating from the Drum Disposal Area. Organic compounds were detected in soil boring samples collected from:

1. The Drum Disposal Area proper (DGC-6);
2. The base of the Columbia Formation close to the Drum Disposal Area (DGC-4);
3. The uppermost Potomac silty clays beneath and adjacent to the Drum Disposal Area (DGC-4); and
4. The top portion of the upper Upper Potomac sands (DGC-6,DGC7, DGC-8).

Organic compounds detected in formation soils included, toluene, methylene chloride, Acetone, 4-Methyl-2-Pentanone, ethylbenzene, 1,2-

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dichloroethane, xylene, phenol, bis-2-chloroethyl ether, napthalene, 4-Methylphenol, 2-Methylphenol and 2-Butanone. Also, Columbia Formation samples generally have increased metals concentrations (chromium, lead, and nickel in DGC-4, DGC-6, DGC-8 and DGC-9). In general, the formation soil chemistry mimics the groundwater chemistry in extent and nature, indicating that contaminants are migrating with the groundwater and adsorbing onto the soil.

Table 1-1 is a list of organic compounds found at the site. The highest soil concentrations observed at the site are listed with corresponding acceptable cleanup levels as provided by the record of decision.

1.5 Project Organization

Project organization is shown in Figure 1-2. The chain of command in the event of a health/safety-related occurrence is found in the Safety, Health and Emergency Response Plan.

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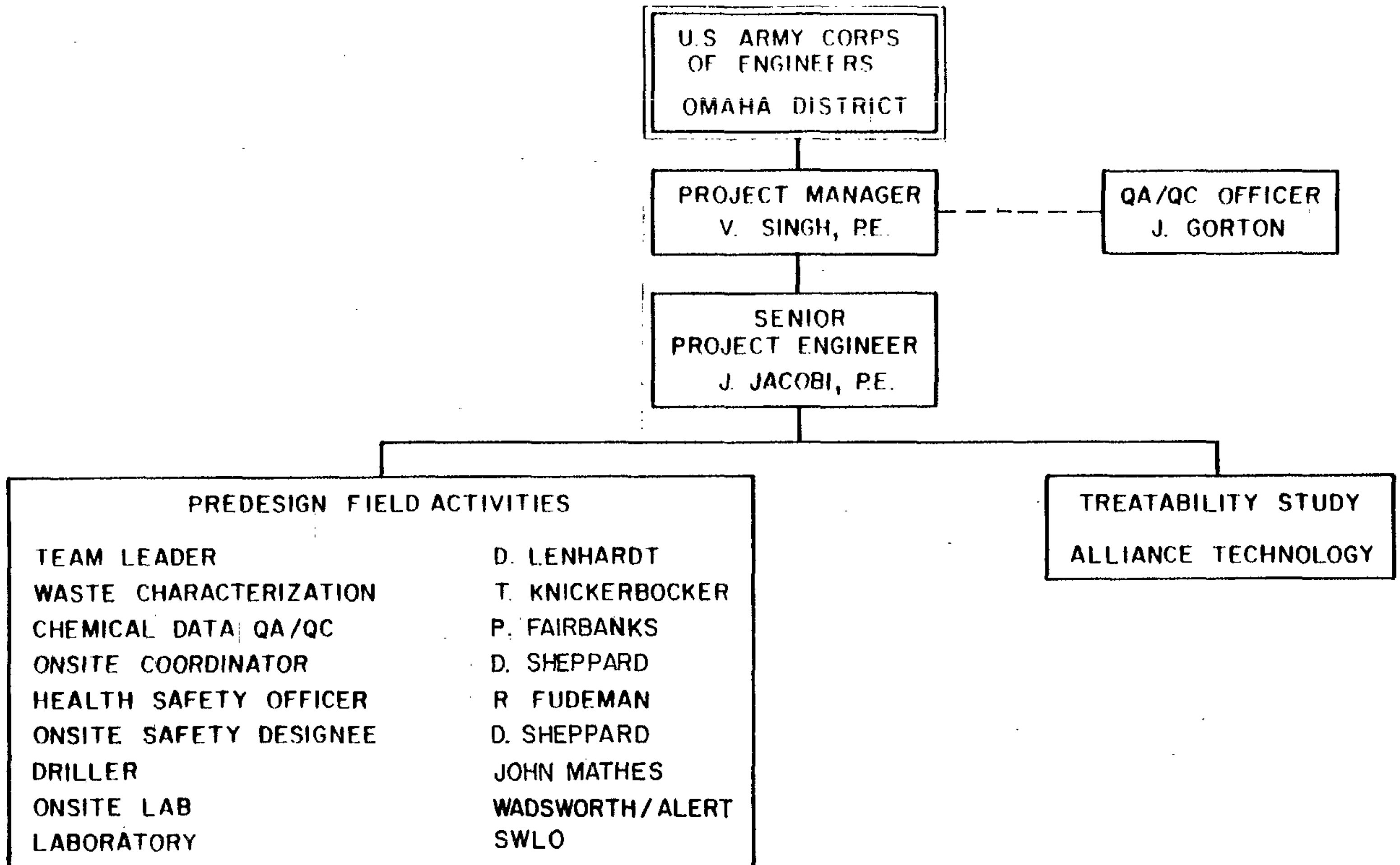

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PROJECT ORGANIZATION CHART

FIGURE 1-2

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TABLE 1-1

ORGANIC COMPOUNDS OF CONCERN
DELAWARE SAND AND GRAVEL SITE

Compound	Highest Observed Soil Conc.* ppm (mg/kg)	Acceptable Soil Conc.* ppm (mg/kg)
Toluene (9)	1.900	6,000.
Methylene Chloride	0.72	0.62
Acetone (9)	4.4	77.0
4-Methyl-2Pentanone (9)	3.1	78.0
Ethylbenzene (9)	0.2	7,500
1,2-Dichloroethane	1.2	0.7
Xylene (9)	1.1	4.8
Phenol (9)	2.1	497.0
bis-2-chloroethyl ether	0.18	0.004
Naphthalene (8)	4.2	4,300.
4-Methylphenol (9)	0.24	4,600
2-Methylphenol (9)	1.4	4,600.
2-Butanone	7.6	610

* Analytical values taken from Table 7 of the Record of Decision for the Delaware Sand and Gravel Site, 4-22-88.

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2.0 FIELD ACTIVITIES, SAMPLING, AND SAMPLE CUSTODY PROCEDURES

The following sections describe the various tasks that will be performed as part of the pre-design field activities at the Delaware Sand and Gravel Superfund site. The plan provides our general approach to the field investigation and presents the scope of work required for each task. Details of other investigatory methods may be found in the A-E Quality Control Plan (A-E QCP), A-E Laboratory Quality Management Plan (A-E LQMP) and the A-E Safety, Health and Emergency Response Plan (A-E SHERP).

2.1 Surveying and Mapping

A topographic site base map of the Delaware Sand and Gravel landfill (1" = 50' scale) prepared for Dunn Geoscience by E. Richardson Associates will be used during the Pre-Design field activities. Field surveys will be conducted for locational control during the site investigation, and to establish the locations and elevations (to the nearest 0.1 foot) of all soil borings and test trenches. Vertical control will be set using the National Geodetic Vertical Datum of 1929. Horizontal control will be referenced to the permanent features onsite (i.e. recovery wells). Horizontal Closure will meet or exceed 1 inch: 20,000 inches, and vertical closure will meet or exceed 0.035 x m, with m being the distance in miles. All surveying will be performed by URS under the supervision of a licensed surveyor.

2.2 Construction of Support Facilities

For logistical support of site investigation activities, a command office, equipped with telephone, electricity, potable water and toilet; an equipment/vehicle decontamination pad with water hookup, sump, sump pump, and discharge line to above-grade holding tanks; and fully equipped onsite laboratory facilities, will be installed and maintained during the site investigation. The office and laboratory trailers will be located

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in the Support Zone. The decon pad and appurtenances will be set up in the Contamination Reduction Zone (See A-E-SHERP for description of zones.)

Temporary protective fencing will be erected around the active-drilling sub-zone of the Exclusion Zone. Steel chain-link fencing will be installed around the Support and Contamination Reduction Zones. A guard will be present during non-work hours.

Further details of temporary site installations and work zones are presented in the A-E-SHERP

2.3 Air Screening Procedure

To determine air quality over the site prior to startup of intrusive activities (e.g. borings, test trenches), air screening will be conducted using a photoionization organic vapor detector (PID). Readings will be recorded in a field notebook, and locations with significant readings 3-5 times above background will be flagged with field markers.

Summary: Air will be screened for volatile organics using a portable photoionization detector (PID). While the PID will not identify or quantify individual compounds, it can be standardized and used to quantify relative differences between samples for total aromatic vapors present.

Procedure: 1) Calibrate the instrument to a benzene standard and "zero" the instrument at an upwind (from the site) location.

2) At each point record a reading of the instrument in the breathing zone (4'-6' above the ground). Then record a reading just above the ground surface.

3) The photoionization detector must be decontaminated when leaving the Exclusion Zone. This will be performed by depositing the instrument at the equipment drop. The instrument will be cleaned by

wiping with a damp cloth. During days of precipitation, wrap the instrument in a plastic bag to protect the electronics from moisture and to help in the decon procedure.

A field notebook to record the air screening survey results will be initiated at the start of onsite work and maintained by the Senior Field Technician. The field notebook will include the following daily information regardless of what activity is being performed:

1. Date
2. Meteorological conditions
3. Crew members
4. Brief description of proposed field activities
5. Locations where work is performed (grid system)
6. Problems and corrective actions taken
7. All field measurements or descriptions recorded
8. Calibration of field equipment used
9. All modifications of the A-E Site Sampling Plan

2.4 Magnetometer Survey

A limited magnetometer survey will be conducted at each borehole to determine the presence of buried metallic objects. The survey will be performed using a proton procession magnetometer (eg. BC Model GM 122) which functions by inducing a local electromagnetic field that is enhanced by buried metallic objects. At each boring location, magnetometer readings will be recorded within a small grid covering the location. Three readings will be recorded per grid station and these readings compared with concurrent base station readings from a location considered to be unaffected by the induced magnetization of the site.

If a metallic object is detected, the borehole will be relocated five feet from the original location. In the drum disposal area proper, if an alternate location cannot be found within five feet of the original

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borehole, the original borehole will not be offset, and drilling will commence at an alternate location.

2.5 Field Sampling

2.5.1 Sampling Locations

The site investigation is designed to delineate the horizontal and vertical extent of soil contamination in the Drum Disposal and Ridge Areas. In addition, representative soil/waste samples will be collected for the thermal treatability study. To accomplish these objectives, a combination soil boring and test trenching program has been developed. This program has been developed based upon direction provided by USACE and upon information presented in the RI/FS report. Should site conditions be found to deviate from those used to develop this program, USACE will be promptly notified and changes to the field program proposed to reflect the changed conditions.

2.5.2 Drum Disposal Area

The Drum Disposal Area consists of two distinct sites. The Drum Disposal Area proper (Area 1a) was defined from surface geophysics conducted during the RI. It lies just south of the railroad track, occupying 0.42 acres (Figure 2-1). The second area (Area 1b), located west of Area 1a, is suspected of being a site of limited drum disposal activities; it occupies 0.25 acres. In addition, a third area, peripheral to Areas 1a and 1b, has been designated for investigation to confirm the outer limits of contamination around Areas 1a and 1b. Investigation of this area is required since soil contamination has been reported immediately west of Area 1b, and a reasonably accurate determination of waste area and volume is critical for subsequent development of the bid documents. Investigation of the Drum Disposal Area will proceed from peripheral areas of little suspect contamination towards the center of the defined anomaly.

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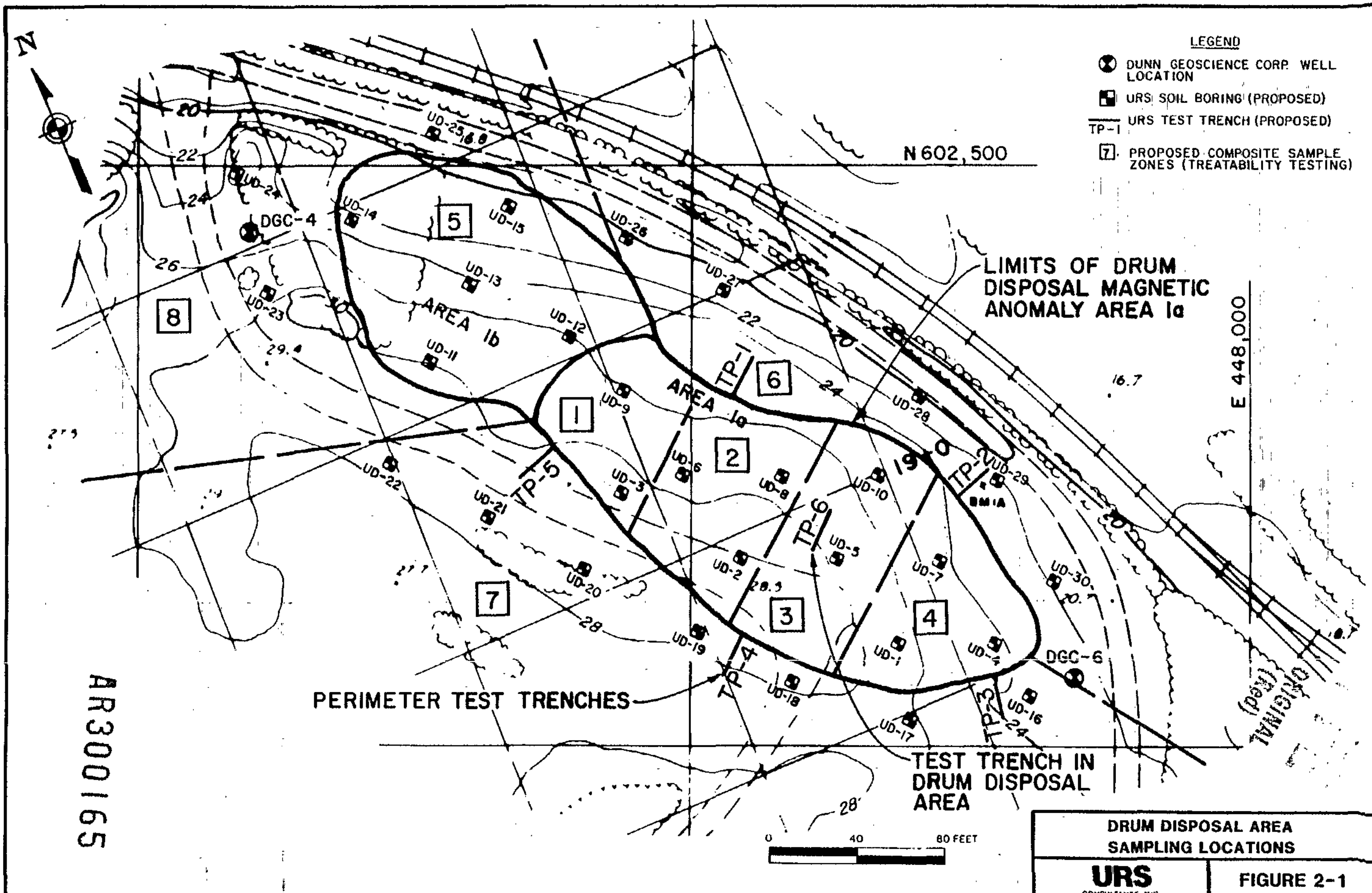

DRUM DISPOSAL AREA SAMPLING LOCATIONS

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FIGURE 2-1

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In Area 1a of the Drum Disposal Area, a total of 6 test trenches, are planned (Figure 2-1). The purpose of the test trenches is to define the outer limits of disposal and to determine the condition of drums present. These test trenches will be excavated prior to drilling and are an essential component of this investigation due to: (1) the poorly understood pattern of disposal at the site; and (2) the risks associated with drilling through unknown, potentially contained waste. The proposed plan is to excavate 5 test trenches towards (and intersecting) the waste from undisturbed areas. The sixth test trench will be dug in the center of the drum disposal area. This trench will determine if drums were deposited (stacked) in a pit and the condition of any drums present. The length of the trench will be approximately 20 feet.

In addition to the test trenches, 10 soil borings are proposed in the Drum Disposal Area proper (Area 1a). Depth of boring in this area is estimated at 30 feet (the approximate depth to the upper Potomac confining clay). The test boring program is based on the assumption that extensive areas of intact drums with contained waste do not exist within the disposal area. If, however, a buried drum is encountered during drilling, the depth of the drum will be noted on the boring log, and an attempt will be made to collect a sample from the drum. The borehole will be immediately backfilled. The drill rig and tools will be decontaminated and one attempt will be made to relocate the boring. Another boring will be attempted near the original boring. The relocated boring will be advanced and sampled as previously specified.

The second area (Area 1b) will be investigated utilizing 5 soil borings (Figure 2-1). These borings are intended to investigate contiguous areas of suspect disposal. The exact placement of borings will be based on data generated during the RI and results of our site inspection. In addition to the 15 soil borings planned within areas 1a and 1b, 15 additional borings are planned around the perimeter of the Drum Disposal Area to determine whether contamination has spread laterally

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beyond the limits of known or suspected waste disposal. Boring depths are estimated at approximately 30 feet. The exact depth and location of borings may be modified, depending upon the findings of the test trench program, field observations, drilling response and screening of samples for target parameters.

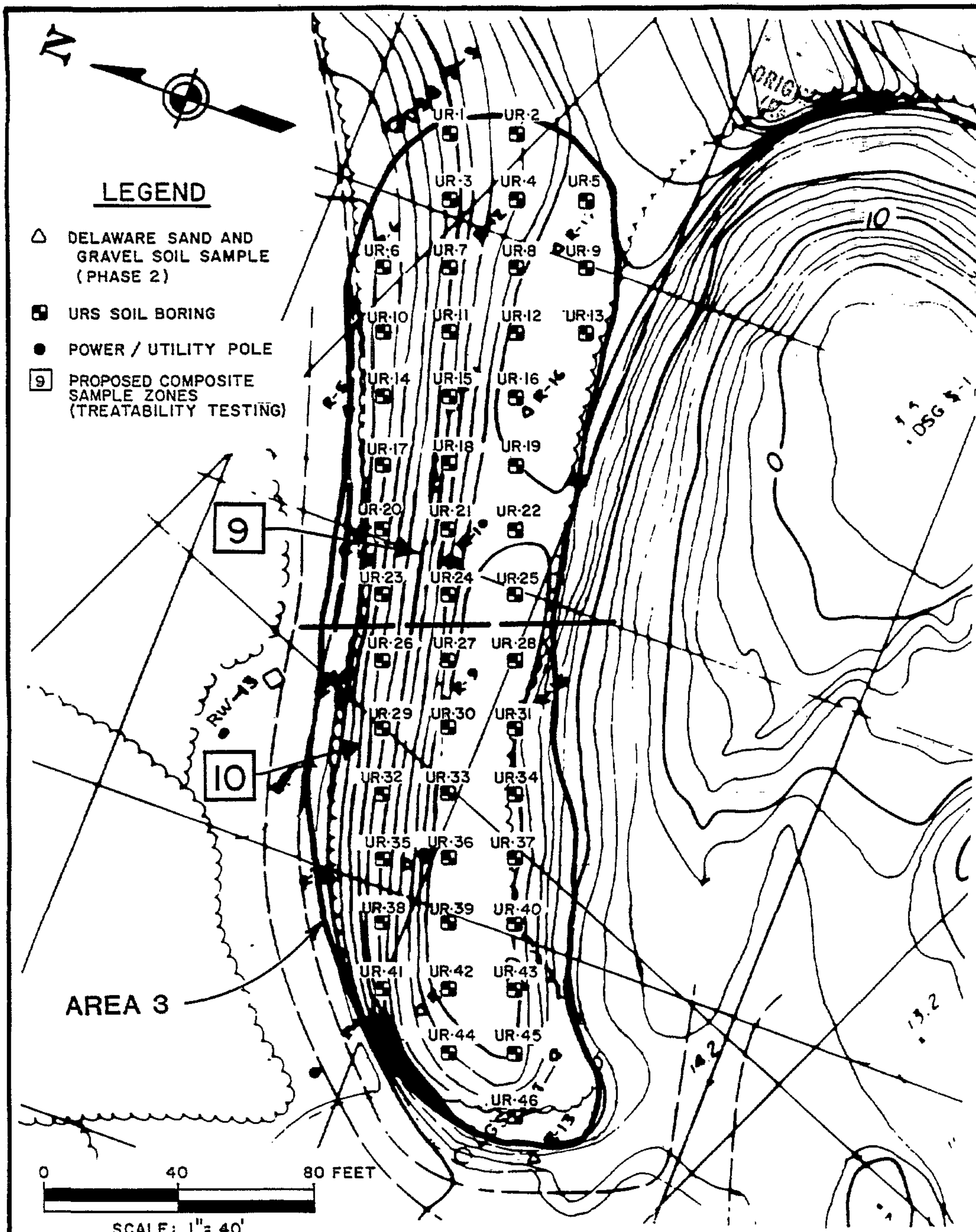
2.5.3 Ridge Area

The purpose of the investigation of the Ridge Area is to define the horizontal and vertical extent of soil contamination. Several hot spots of metals and organics were detected in samples collected during the RI/FS. For budget purposes a systematic sampling program using a 20-foot by 20-foot grid has been defined (Figure 2-2). It is estimated that a total of 46 soil borings will be required to adequately characterize contamination within this area. Depth of boring will be approximately 5 feet and continuous soil samples will be obtained.

Because of the random nature of storage and disposal practices in the ridge area, the actual location and depth of borings will be determined in the field to sample obviously contaminated areas. This flexibility in the sampling plan is required to ensure the detailed delineation of individual spill areas and to avoid unnecessary duplication of sampling from previous site investigation. Due to the inaccessibility of portions of the Ridge Area, a combination of drilling with an ATV drill rig and hand augering will be used to complete this task.

2.5.4 Sample Collection/Analysis Strategy

The number and interval at which soil/waste samples are obtained during the drilling program will be at the discretion of the sampling personnel. To provide guidance during sampling, the following sample collection plan has been developed. In the Ridge Area, sampling will be continuous to a depth of approximately 5 feet. Deeper sampling will be performed as necessary to define the vertical extent of contamination.



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RIDGE AREA SAMPLE POINTS

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FIGURE 2-2

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In the Drum Disposal area, sampling will be continuous through the thickness of waste materials. In peripheral areas, samples will be obtained at 2.5-foot intervals from the surface to a depth of 15 feet. At depths exceeding 15 feet and at depths beyond the extent of concentrated contamination, soil samples will be obtained at 5-foot intervals to termination of boring.

All soil/waste samples collected during the field investigation will be screened in the field using both OVA (FID) and PID (HNu) organic vapor detectors. The detectors will be calibrated to target those groups of volatile and semivolatile organic compounds previously identified as major components of contamination at the site.

Samples with low contaminant concentrations or at concentrations below the sensitivity of the field detectors, will receive additional screening at an onsite laboratory equipped with GC instrumentation to detect site-specific indicator chemicals (Table 1-1) at cleanup levels reported in the ROD. The use of an onsite laboratory to pre-screen field samples for analytical analysis will reduce the number of samples requiring characterization by providing a quantitative basis for sample selection. The onsite laboratory will also provide quick analytical turn-around which will facilitate a more effective allocation of field effort while minimizing the possiblity of having to conduct additional site investigations to further define the limits of contamination. Specific details regarding analytical methods, procedures and equipment requirements are provided in the A-E Quality Control Plan.

For cost estimating purposes, an average of three (3) samples will be submitted from each borehole in the Drum Disposal Area for analysis of site waste characteristics as specified by the USACE. The exact number of samples required to define contaminant limits in respective boreholes will, however, be a function of the degree and extent of contamination as defined by sample screening. Using this criteria, 90 soil/waste samples will be obtained from boreholes in the Drum Disposal Area. In the Ridge

Area, one sample will be obtained from each borehole for waste characterization analysis for a total of 46 samples.

In addition to samples collected from boreholes, 16 separate waste samples will be collected from the test trenches in the Drum Disposal Area (2 from each perimeter trench, 6 from interior trench), and 4 waste samples will be reserved for analysis of surface/drummed waste in the Ridge Area. These samples will also be analyzed for the waste characterization parameters as defined by the USACE for this contract. Analytical testing will be performed on drill cuttings and decontamination waste water for RCRA hazardous waste characteristics to determine the ultimate disposition of these materials.

Utilizing the above-outlined strategy, 136 samples will be submitted from the Drum Disposal and Ridge Areas to define the extent of site contamination for subsequent excavation and thermal treatment. In addition to these samples, 32 soil/waste composites will be submitted for waste characterization as identified in the Incineration Treatability Testing Plan. This includes 4 composite samples from the drum Disposal Area proper (Area 1a), 24 composites from Area 1b and perimeter borings, and 4 composites from the Ridge Area. The compositing scheme for each of these areas is described in the Treatability Testing Plan. The exact composition of sample composites will, however, be dependent on the compatibility of individual samples. Samples which are incompatible or reactive will not be mixed to form composites. Table 2-1 summarizes the type and number of samples and parameters to be analyzed for each group of samples.

Prior to compositing samples for treatability testing, compatibility testing will be performed in the field. The purpose of this testing is to ensure that individual samples may be safely mixed for subsequent testing and feasibility of waste removal and handling during the remedial design and construction. Compatibility testing procedures are detailed in the A-E QCP. Waste sample compositing procedures and analytical

TABLE 2-1

SUMMARY OF REQUIRED SAMPLES

Sample Type	Number of Field Samples	A-E Lab QC Samples		USACE Lab QA Samples	Total	Analytical Schedules (Table 2-1A)
		Field Duplicates	MS/MSD			
1. Soil Borings	136	14	14	14	178	E
2. Surface/Drum Waste	20	2	2	2	26	D
3. Borehole Composites	32	3	3	3	41	A
4. Drill Cuttings/Decon Water	6	1	1	1	9	B
5. Muffle Furnace Residue* Phase I	21	2	2	2	27	C
6. Muffle Furnace Residue** Phase II	12	1	1	1	15	C

* The Muffle Furnace Residue has been replaced with Treatability Study, see Table 6-1.
** The Muffle Furnace Residue, Phase II has been dropped from the program.

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TABLE 2-1A

ANALYTICAL SCHEDULES, SAMPLE CONTAINER, VOLUME, AND HOLDING TIME REQUIREMENTS

Parameter	Document/Method No.	Reference	Container Volume	Container Type	Holding Time
Schedule A:					
Volatile Organics	8240-CLP	2	2-40 ml	VOA vials with teflon septa	14 days
Specific Gravity	D287	1	500 ml	Wide mouth glass jar with teflon lined cap (1)	NA
Heat of Combustion	D2382	1			"
Percent Moisture	3540	2			"
Flashpoint	1010 or 1020	2			"
Viscosity	D1092	1			"
Ash	D482	1			"
Fusibility	D1857	1			"
Particle Size	F490	1			"
pH	9040/9045	2			"
Halogens (Br, F, I, Cl)	9020/9022	2			"
Acid/Base Neutral Organics	8270-CLP	2			14 days (2)
Pesticides/PCBs	8080-CLP	2			14 days (3)
Dioxins/Furans	8280	2			6 months
Cyanide	9010A/9010	2			14 days
Sulfide	9030	2			7 days

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TABLE 2-1A (Continued)

Parameter	Document/Method No.	Reference	Container Volume	Container Type	Holding Time
Scedule A: (Continued)					
Ultimate Analysis Carbon, Hydrogen, Oxygen	D-3178	1			NA
Nitrogen	D-3179	1			NA
Sulfur	D-3177	1			NA
Ash	D-3174	1			NA
Moisture	D-3173	1			NA
Metals	3050/6010	2			6 months
Arsenic	3050/7060	2			"
Lead	3050/7421	2			"
Selenium	3050/7740	2			"
Mercury	7471	2			28 days

Note: For Schedule A parameters, one additional 500 ml glass jar, and two additional 40 ml VOA vials must be collected for samples collected in duplicate. Two additional 500 ml glass jars and four additional 40 ml VOA vials must be collected for samples requiring a matrix spike/matrix spike duplicate (MS/MSD).

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TABLE 2-1A (Continued)

Parameter	Document/Method No.	Reference	Container Volume	Container Type	Holding Time
Schedule B:					
EP Toxicity - Metals & Organics	1310	2	500 ml	Wide mouth glass jar with teflon lined cap (1)	14 Days (b)
Ignitability	1010 or 1020	2			NA
Corrosivity (as pH)	1110	2			"
Reactivity	9010/9030	2			"

Note: For Schedule B parameters, one additional 500 ml glass jars must be collected for samples collected in duplicate. Two additional 500 ml glass jars must be collected for samples requiring a matrix spike/matrix spike duplicate (MS/MSD).

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TABLE 2-1A (Continued)

Parameter	Document/Method No.	Reference	Container Volume	Container Type	Holding Time
Schedule C					
TCLP Metals	F.R. Vol. 51 No. 216	3	500 ml		14 days (b)
Metals	3050/6010	2	250 ml		6 months
Arsenic	3050/7060	2			6 months
Lead	3050/7421	2			6 months
Selenium	3050/7740	2			6 months
Mercury	7471	2			28 days
Acid/Base Neutral Organics	8270-CLP	2			14 days (b)
Pesticides/PCBs	8080-CLP	2			14 days (b)

Note: For Schedule C parameters, one additional 500 ml glass jar must be collected for samples collected in duplicate. Two additional 500 ml jars must be collected for samples requiring a matrix spike/matrix spike duplicate (MS/MSD).

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TABLE 2-1A (Continued)

Parameter	Document/Method No.	Reference	Container Volume	Container Type	Holding Time
Schedule D:					
Volatile Organics	8240-CLP	2	2-40 ml	VOA vials with teflon septa	14 days
Acid/Base Neutral Organics	8270-CLP	2	250 ml	Wide mouth glass jar with teflon lined cap	14 days (b)
Pesticides/PCBs	8080-CLP	2			14 days (b)
Dioxins/Furans	8280	2			30 days (c)
Cyanide	9010A/9010	2			14 days
Sulfide	9030	2			7 days
Metals	3050/6010	2			6 months
Arsenic	3050/7060	2			6 months
Lead	3050/7421	2			6 months
Selenium	3050/7740	2			6 months
Mercury	7471	2			28 days

Note: For Schedule D parameters, two additional 40 ml VOA vials and one additional 250 ml glass jar must be collected for samples collected in duplicate. Four additional 40 ml VOA vials and two additional 250 ml glass jar must be collected for samples requiring a matrix spike/matrix spike duplicate (MS/MSD).

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TABLE 2-1A (Continued)

Parameter	Document/Method No.	Reference	Container Volume	Container Type	Holding Time
Schedule E:					
Volatiles	8240-CLP	2	2-40 ml	VOA vials with teflon septa	14 days
Acid/Base Neutral Organics	8270-CLP	2	250 ml		14 days (b)
Pesticides/PCBs	8080-CLP	2			14 days (c)
TRPH	9071/418.1	2 and 4			14 days
Cyanide	9010A/9010	2			14 days
Metals	3050/6010	2			6 months
Arsenic	3050/7060	2		wide mouth glass jar with teflon lined cap	6 months
Lead	3050/7421	2			6 months
Selenium	3050/7740	2			6 months
Mercury	7471	2			28 days

Note: For Schedule E parameters, two additional 40 ml VOA vials and one additional 500 ml glass jar must be collected for samples collected in duplicate. Four additional 40 ml VOA vials and two additional 250 ml glass jar must be collected for samples requiring a matrix spike/matrix spike duplicate (MS/MSD).

Notes:
(a) All sample containers filled in the field must have zero or minimum headspace; however, settling may occur thereafter.
(b) Sample extraction within 14 days, analysis within 40 days of collection, where indicated.
(c) Sample extraction within 30 days, analysis within 45 days of collection, where indicated.
(d) All samples must be kept refrigerated at four (4) degrees Centigrade.
(e) The laboratory analytical reports and all other deliverables will conform to the latest USEPA Contract Laboratory Program (CLP). Data reports for non-CLP analysis will include, at a minimum, parameter concentrations when above detection limits, compound specific parameter concentrations when above detection limits, compounds specific method detection limits, daily lab blanks, "hits", surrogate spike, matrix spike, laboratory duplicate, laboratory duplicate spike, any other quality control sample results, and copies of new data as per the CLP format

References:
1) American Society for Testing and Materials: Volume 5, ASTM 1989
2) Test Methods for Evaluating Solid Waste, USEPA SW-846, November 1986, Third Edition.
3) Federal Register Volume 51, No. 216
4) Methods of Chemical Analysis for Water and Wastes, USEPA Cincinnati, Ohio. EPA 600/4-79-020, Revised March 1983.

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requirements are defined in the Thermal Destruction Treatability Testing Plan.

2.5.5 Soil/Waste Sampling

Soil and waste samples retrieved in the course of drilling will provide material for examination at the surface and for analytical testing. A description of the sampling and testing protocols is provided below:

(a) Split-Spoon Sampling - Each borehole site will be sampled using a 3-inch stainless-steel split-spoon sampler to ensure sufficient sample volume for analytical analysis. Split-spoon samples will be collected following the guidelines for sample collection presented in Section 2.5.4. Barring sample requirements for physical and chemical testing, efforts will be made to maintain the samples in as complete a condition as possible. Between sample intervals the sampler will be decontaminated as specified in Section 2.9.

(b) Sampling Protocol - Sample collection will be done under the supervision of the QA Officer and performed by the Field Geologist, who will record and label the sample, place it in a suitable container, and provide a field log. Split-spoon samples will be placed in jars, and all split-spoon samples will be stored within a secure area on site. The samples will eventually be placed in drums for final disposal. Sample volumes will meet or exceed all geotechnical and analytical requirements of the A-E contract laboratories and the USACE QA laboratory. They shall also be consistent with the USACE Sample Handling Protocol for low, medium, and high concentration samples of hazardous waste, draft, September 1988.

The portion of the split-spoon sample that represents slough shall not be sampled for analytical purposes and will be discarded and drummed. Soil grab samples for volatile organics analysis will be obtained by subsampling the material retrieved in the split spoon in a random manner. Subsampling shall be done immediately upon opening the split spoon, and as soon as possible after the split-spoon sample is taken from the borehole.

Samples for non-volatiles analysis, including all remaining TCL organic parameters and TAL metals, will be composited after VOA subsamples and sample slough has been removed. The samples for non-volatiles analysis will be obtained from a single split-spoon interval. The amount of soil composited will meet or exceed the volume requirement for all remaining chemical analyses. Compositing of soil samples will be performed in a stainless-steel bowl using stainless-steel stirring devices that have been decontaminated prior to each compositing procedure. The compositing procedure and subsequent distribution of soil into sample bottles shall be accomplished in a manner that minimizes contaminant loss and ensures representative samples.

(c) Borehole Log - All field samples will be visually inspected and classified using the USCS classification system. They will be inspected for signs of contamination, and screened with an HNu and OVA meter for the presence of organic vapors. Materials description will be in accordance with ASTM procedure D2488-84, 'Practice for Description and Identification of Soils (Visual-Manual procedure)'.

In addition, the geologist will note details with respect to sampling (e.g., percentage recovery, standard penetration blow counts), caving of the auger hole, difficulty in augering, and depth to water, if applicable. Information obtained during drilling and sampling will be combined with the results of geotechnical testing on select samples to prepare a final borehole log (Figure 2-3) for each borehole location.

(d) Geotechnical Laboratory Testing - Laboratory tests to be undertaken on soil samples collected during the drilling program are summarized below:

ORIGINAL

URS CONSULTANTS, INC.	TEST BORING LOG BORING NO.
PROJECT:	SHEET NO. OF
CLIENT:	JOB NO.:
BORING CONTRACTOR:	ELEVATION:

GROUND WATER					CAS.	SAMP.	CORE	TUBE	DATE STARTED:
DATE	TIME	WATER EL.	TYPE	TYPE					DATE FINISHED:
				DIA.					DRILLER:
				WT.					DRILL RIG:
				FALL					INSPECTOR:

DEPTH FEET	STRATA	SAMPLE NO.	SAMPLE TYPE	SAMPLE BLOWS PER 6 INCHES	REC. %	COLOR	CONSIST. HARDNESS	DESCRIPTION	CLASS	REMARKS
0										
5										
10										
15										
20										
25										
30										
35										
40										
45										

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URS CONSULTANTS, INC.	TEST BORING LOG	FIGURE 2-3

ORIGINAL (Red)

Test	ASTM Procedure	Number of Test Samples
Moisture Content	D2217-85	40
Specific Gravity	D854-83	20
Grain Size	D422-72	20
Atterberg Limits	D4318-84	20

The location and depths at which representative samples will be selected for analysis will be determined by the field geologist in consultation with the project geotechnical engineer. In addition, specific gravity and grain size will be determined on the soil/waste composites submitted for treatability testing.

(e) **Site Restoration**

URS will restore onsite work locations to their original state within 10 working days of completion of field investigations. The restoration will be carried out so as to meet with the approval of the contracting officer.

2.5.6 Field Screening of Soil Samples

All soil samples obtained from boreholes will be field screened for organic vapors and visually inspected for contamination in order to achieve the goals of the chemical analysis strategy, (Section 2.5.4). The detailed procedure for field screening samples is outlined below.

Procedure: (1) Open split-spoon samples immediately upon retrieval.

(2) Monitor soil core directly for organic vapors using organic vapor detectors (PID and FID). Record background air and soil core readings in field log book

(3) Visually inspect soil core and describe physical characteristics (e.g. soil and waste type(s), and

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obvious contaminant features (e.g. discoloration, sheen, etc.) Record observations in field log book

(4) Obtain sample for volatile organic analysis if vapor readings are 5 times greater than background levels.

(5) Retain sample for chemical analysis if visual indications of contamination or waste sample.

(6) Place unused sample in clean, labelled glass sample container and transfer to onsite lab for subsequent screening. Store in secure (sheltered) area for future reference.

Note: Organic vapor detectors will be calibrated as described in Section 5.0 to target site-specific organic compounds.

2.5.7 Sample Containers/Coolers, Preservation, and Holding Times

The Contract Laboratory will supply all material and equipment necessary to obtain all required samples. This includes the sample bottles, preservatives, ice bags, coolers, sample labels, and chain-of-custody forms. All sample containers, preservatives, etc., needed for the QA (split) samples will also be supplied by URS or the Contract Laboratory.

The purpose of sample preservation is to prevent or retard the biodegradation and alteration of chemicals in samples during transit and storage. Efforts to preserve the integrity of the samples will be initiated at the time of sampling and will continue until analyses are performed. Sample holding time requirements apply to all samples. All samples will be shipped via overnight carrier the same day they are collected. Sample container, preservation and holding time requirements for samples to be submitted for analysis are summarized in Table 2-1. QA and QC samples for each matrix type will be obtained in accordance with USACE guidelines for submittal or external QA samples. AR300182

2.5.8 Sample Documentation and Chain-of-Custody

Sample documentation procedures require the use of sample labels (Figure 2-4), chain -of-custody forms (Figure 2-5), chain-of-custody seals (supplied by the laboratory), and a bound and numbered field log book.

Sample Label

A sample label as shown in Figure 2-4 will be affixed to each sample container. This label identifies the sample by documenting the Project Name, sample identification, name(s) of sampler(s), date the sample was collected, and the preservative, if any, added to the sample. A unique number is assigned to each sample collected.

Chain-of-Custody

The chain-of-custody form, shown in Figure 2-5, will be used to record the number of samples collected and the requested laboratory analyses. Information included on this form consists of time and date of sample collection, sample number, type of sample, sampler's name, preservative used, and any special instructions. A copy of the chain-of-custody form will be retained by the sampler prior to shipment. The original chain-of-custody form will accompany the sample to the laboratory, providing a "paper trail" to track the sample.

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URS CONSULTANTS, INC

Project Name/# ____

Sample I.D. ____

Date ____

Sampler's Name ____

Preservation ____

Analyses ____

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URS CONSULTANTS, INC.	SAMPLE IDENTIFICATION LABEL	FIGURE 2-4

A-3130

A-3080

CLIENT NAME ______________________ CLIENT PROJECT NO. ______________________

BID PACK NO. ______________

CHAIN OF CUSTODY RECORD

URS PROJECT NO.:

SITE NAME

SAMPLERS (SIGNATURE)

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS							REMARKS

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE	TIME	REMARKS	

DISTRIBUTION ORIGINAL ACCOMPANIES SAMPLES, YELLOW COPY TO LABORATORY, PINK COPY TO FIELD FILES

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URS
CONSULTANTS, INC.

CHAIN OF CUSTODY RECORD

FIGURE 2-5

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Field Log Book

The field log book serves primarily as a daily log of activities carried out during the investigation. Any observations made during field activities will be recorded in this log. This field log book will also be used during sampling activities to record sampling locations and the unique number assigned to the corresponding samples collected from that particular site. The field log book will be bound with sequentially numbered pages. All entries in the log book will be made with indelible ink.

2.5.9 Preparation of Bottles

The analytical laboratory, with guidance or direction from the Chain-of-Custody Officer, will prepare labels or tags for pre-cleaned sample containers (e.g., jars, bottles, vials) prior to the transfer of these containers to the field.

All sample containers provided to field personnel will be properly cleaned according to USACE approved methods.

2.5.10 Packaging and Shipping

Packaging and shipping requirements will follow protocols established by USACE for transferring samples collected by Superfund contractors to the analytical laboratory. The following packaging and shipping requirements are taken from the "Sample and Handling Protocol for Low, Medium and High Concentration Samples of Hazardous Waste," (Draft) published by USACE in September 1988.

- o Use waterproof metal (or equivalent strength plastic) ice chests or coolers only

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- Secure sample bottle lids with strapping tape or evidence tape. For bottles other than VOA vials, secure the lid with strapping tape. (Tape on VOA vials may cause contamination). At the same time secure string from USEPA-numbered tag around the lid.

- Mark volume level of bottle with grease pencil. Do not mark VOA vials with a grease pencil.

- Position sample bottle in Ziploc bag so that tags may be read.

- Place about 1/2 inch of cushioning material in the bottom of metal can.

- Place sample bottle in can and fill remaining volume of can with cushioning material. Place VOA vials in cardboard canisters and pack for shipping.

- Close the can using three clips to secure the lid.

- Write sample number on can lid. Indicate "This Side Up" by drawing an arrow and place "Flammable Solid N.O.S." label on can, if material is potentially flammable.

- Place about 1 inch of packing material in bottom of cooler.

- Place cans in cooler and fill remaining volume of cooler with packing material. Place bags of ice around, among, and on top of the sample bottles.

- Put paperwork in plastic bags and tap with masking tape to inside lid of cooler.

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- Tape drain shut.

- After acceptance by shipper, tape cooler completely around with strapping tape at two locations. Secure lid by taping. Do not cover any labels.

- Place lab address on top of cooler.

- For all medium and high concentration shipments, complete shipper's hazardous material certification form, if transported by common carrier.

- Put "This Side Up" labels on all four sides.

- Affix numbered custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

The inside of all protective metal containers will be lined with premolded fire- and shock-resistant cushioning while loose vermiculite will be used to cushion metal cans placed inside shipping coolers.

2.6 Drilling Equipment and Procedures

All equipment used in the drilling operation will be steam-cleaned prior to arrival at the site. Hydraulic system leaks, as well as lubricant and fuel leaks, will be eliminated or prevented.

All drilling equipment that comes in contact with soil during drilling will be decontaminated at the decontamination pad located in the contamination reduction zone as described in the A-E SHERP before moving to the next hole. This decontamination will consist of a cleaning with a high-pressure, hot-water cleaner. Between each sample the split-spoon sampler will be cleaned according to the procedures outlined in Section 2.9.

The drilling rig will be set up and operated in accordance with standard drilling practice, and in a manner that will allow the safe and efficient operation of the equipment. Safety considerations respecting equipment operation are addressed in the A-E SHERP. A geologist will be in attendance at all times during drilling in order to:

- monitor drilling activities and collect continuous split-spoons
- prepare field logs based on sample observations
- perform air monitoring using a photoionization detector
- collect, label, package, and handle samples for laboratory analysis
- complete the "Daily Drilling Report"

The exact locations of borings will be determined in the field by survey and judgement of the field and supervising geologist. The field geologist will use his best professional judgement to fulfill the requirements of the drilling program. Site conditions which may affect field decisions include the types of soil/waste and surface materials encountered; the site stratigraphy and waste areas encountered; visual identification of waste or soil staining; organic vapor detector readings from split-spoon samples and drill cuttings; and any special difficulties in drilling. The field geologist will maintain daily contact with the Project Geologist regarding work progress and results of the subsurface investigation.

A technician will be present on site on a regular basis during the drilling program to provide the following services:

- transport samples off site for geotechnical testing

- provide services as required by the field geologist and Onsite Coordinator

The subsurface investigation program will provide information that will assist in geologic, geotechnical, and chemical site interpretation. A list of applicable investigation procedures discussed in the following sections is summarized below:

- Hollow-stem auger drilling
- Split-spoon sampling
- Shallow soil/waste sampling
- Sealing/abandonment of borehole
- Water level monitoring

2.6.1 Hollow-Stem Auger Drilling

Summary: A standard method of subsurface drilling which enables the recovery of representative subsurface samples for identification and laboratory testing.

Procedure: 1) Advance the boring by rotating and advancing the augers the desired distance into the subsurface. The borings will be advanced incrementally to permit continuous or intermittent sampling as required.

2) Remove center plug from augers and sample subsurface as stipulated in Section 2.5.4.

Note: Soil borings to be advanced using 4-1/4" ID hollow stem augers. Should free liquid be encountered within waste areas during drilling, USACE will be notified and alternate methods for casing and advancing the hole will be proposed to ensure containment of leachate within the waste zone.

Reference: American Society of Testing Materials (ASTM), 1988, Standard Practice for Soil Investigation and Sampling by Auger Borings ASTM D1452-80, and Standard Method for Penetration Test and Split Barrel Sampling of Soils, ASTM D1586-84.

2.6.2 Split-Spoon Sampling

Split-spoon sampling is a standard method of soil sampling to obtain representative samples for identification and laboratory testing as well as to serve as a measure of resistance of soil to sampler penetration. The procedure used for this investigation is from the American Society of Testing Materials (ASTM), 1988, ASTM D1586-84, Standard Method for Penetration Test and Split Barrel Sampling of Soils.

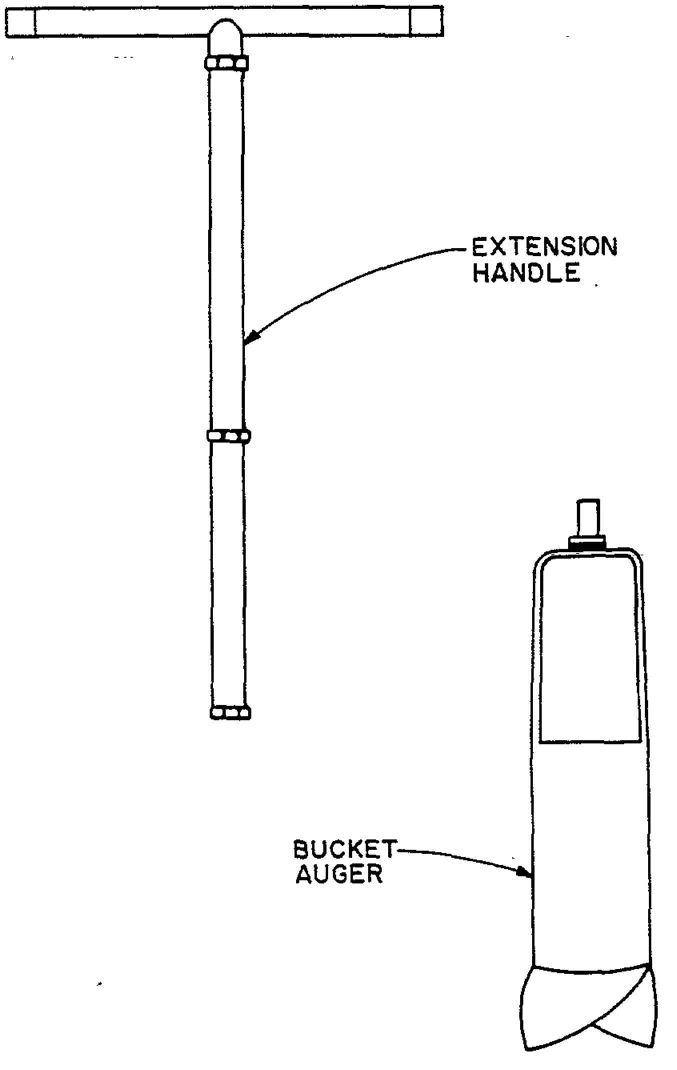
2.6.3 Shallow Soil/Waste Sampling

Shallow probe samples may be collected by use of a stainless-steel bucket hand auger (Figure 2-6). The depth to sampling is soil-matrix dependent and is generally limited to less that 10 feet. The procedure used for this sampling method is from, "Characterization of Hazardous Waste Sites, A Methods Manual, Volume 2, Available Sampling Methods", 3rd Ed., USEPA, Nov. 1986.

2.6.4 Sealing/Abandonment of Boreholes

Boreholes will be sealed (plugged) prior to abandonment to prevent downhole contamination. Sealing will consist of backfilling the borehole with a cement/bentonite grout. The grout will be introduced from the bottom to top using a tremie pipe.

Procedures: (1) Prepare grout using the following mixture ratios:



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URS CONSULTANTS, INC.	**HAND AUGER**	**FIGURE 2-6**

A-3084

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Grout Slurry Composition (% Weight)

1.5 to 3.0% - Bentonite (Quick Gel)
40 to 60% - Cement (Portland Type I)
40 to 60% - Water (Potable)

(2) Mix sufficient volume to fill auger hole plus 10 percent.

(3) Record the type and amount of materials used during the mixing operation.

(4) Pump grout using 1-1/2-inch tremie pipe progressing upwards from bottom of hole.

(5) When grout return is achieved at the surface, remove casing and top-off the borehole with grout. If the casing is not to be removed, cut-off near ground surface. Record amount of grout used to seal hole.

(6) Clear and clean the surface near the borehole and return to pre-existing grade. Add grout as necessary to the area near the borehole.

2.6.5 Water Level Monitoring

In the event that water is encountered while the test borings are being advanced, records will be kept of the following: 1) depth of first encounter of water; 2) water level in augers in place at end of work day and at beginning of work the following day, and 3) water level at borehole completion. A 24-hour water level will be recorded only in those borings where water is encountered within a waste or contaminated zone. In those instances, the boring will be drilled to the fill/soil interface and a 24-hour reading recorded before advancing the augers. In most instances, a 24-hour reading is unnecessary since the Columbia formation is effectively dewatered by ongoing pumping activities.

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2.7 Test Trenching Program

Six test trenches are planned for the Drum Disposal Area (Area 1a). The test trench program has been designed to explore the perimeter and interior of the magnetic anomaly (Area 1a) to determine the presence and condition of buried drums. The test pits will be excavated using a backhoe with a 24-inch bucket an equipped with a face shield and air bottles. Test trenches will not be shored, although the sidewalls will be cut at an angle as necessary to ensure trench stability during excavation. Personnel will not enter any trench. All trenching activities will be performed using Level B personnel protection, with provisions to upgrade to Level A personal protection as described in the A-E SHERP. Trenching personnel will include a health and safety trained backhoe operator and geologist who will work within the immediate vicinity of the trench and two support personnel to perform perimeter monitoring, monitor air supply, and provide emergency response, if needed.

Test trench logs will contain a sketch of pit conditions. Sidewall photographs with a scale for comparison will be taken of each trench. Included in the photograph will be a card showing the test pit number and site name. Test pit locations will be documented by tying in the location to two or more nearby permanent landmarks (trees, house, fence, etc.) and will be located on the site map by survey. Data to be recorded in the field log book will include the following:

- Name and location of job
- Date of excavation
- Approximate surface elevation
- Total depth of excavation
- Dimensions of pit
- Method of sample acquisition
- Type and size of samples
- Soil and waste descriptions

- Photographs
- Groundwater seepage zones and levels
- Organic gas or methane levels
- Other pertinent information, such as waste material encountered

Sampling from test trenches will be performed by the "disturbed" method (see below). All samples collected will be identified on the test trench logs and in the field notebook. Information such as sample number, depth, type, volume, and method of collection will be noted. A final test trench log (Figure 2-7) will be prepared for each test trench location.

<u>Equipment</u>: The following is a list of equipment that may be needed for taking samples from test pits and trenches:

- Backhoe mounted air bottles
- Shovels, picks, scoops, or bucket augers
- Sample containers (5-gal bucket with locking lid for large samples and 250-ml glass bottles for chemical analysis samples)

<u>Trench Excavation</u>: Perimeter trenches will be excavated from undisturbed soil areas towards the magnetic anomaly. Information provided by the RI and from the EPA cleanup action of the Drum Disposal Area will be used to define where trenching should be initiated. Trenching in undisturbed areas will proceed more rapidly and to a shallower depth than in waste areas. Within waste areas, trenching will proceed using extreme caution with material excavation by small lift increments. Depth of trenching in waste area will be approximately 15 feet. If an intact drum is found, excavation will proceed around the drum unless removal is unavoidable or sampling is desired. Sampling of uncontained or drummed waste will be performed as necessary to obtain representative samples of the uncovered material. If an intact

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TEST PIT LOG

CLIENT: ______________________ JOB NO.: ______________
PROJECT: ______________________ TEST PIT NO.: ______________
SITE: ______________________ SHEET ____ OF ______________
CONTRACTOR: ______________________ STARTED: ______________
METHOD OF SAMPLING FINISHED: ______________
– SOIL: ______________________

LOCATION
LATITUDE: ______________
DEPARTURE: ______________
BEARING: ______________

ELEVATIONS
DATUM: ______________
GROUND SURFACE: ______________
BOTTOM OF PIT: ______________
WATER TABLE: ______________

DEPTH (FT.)	SOIL TYPE (UNIF. CLASS)	DESCRIPTION	SAMPLE				
			NO.	TYPE*	SIZE (IN.)	DEPTH (FT.)	NOTES

SHIPPING CONTAINER
N – INSERT
O – TYPE
P – WATER CONTENT TIN
Q – GLASS JAR
Y – CORE BOX
R – CLOTH BAG
S – PLIOFILM BAG
Z – DISCARDED
NA – NOT APPLICABLE

INSPECTOR: ______________ APPROVED: ______________
LOGGED BY: DATE:

A – 1957A

URS CONSULTANTS, INC. | TEST PIT LOG | FIGURE 2-7

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leaking drum is brought to the surface, it will be placed in an overpacked drum and staged for disposal in a secure area onsite. Drums brought to the surface will be inspected for:

- Symbols, words, or other marks on a drum indicating that its contents are hazardous
- Symbols, words, or other marks on a drum indicating that it contains discarded laboratory chemicals, reagents, or other potentially dangerous materials in small-volume individual containers
- Signs of deterioration such as corrosion, rust, and leaks
- Signs that the drum is under pressure, such as swelling and bulging
- Drum type such as polyethylene or PVC line drums, exotic metal drums, single-walled drums used as a pressure vessel and laboratory packs
- Configuration of the drum head (whole lid removable, has a bung, or contains a liner)

Monitoring of the trench and drums will be conducted using a photoionization detector for organic vapors, an explosimeter, and an O_2/H_2S meter. Health and safety procedures for test trenching are described in this AE-SHERP.

<u>Disturbed samples</u>: Disturbed samples are those that have been collected in a manner in which the in-situ physical structure and fabric of the soil have been disrupted. Large disturbed samples will be taken directly from the backhoe bucket during excavation. Care will be taken to assure that the sample is actually from the unit desired and does not include slough or scraped material from the sides of the trench. Bucket augers may be used to directly sample sidewall material from the surface.

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Each trench will be backfilled immediately upon completion. No test trench will be allowed to remain open overnight. Backfilling will proceed by replacing material roughly in the same sequence that material was removed (top to bottom) from the excavation. Before backfilling, the onsite crew will photograph all significant features exposed by the trench and include in the photograph a scale to show dimensions. Photographs of test pits will be marked to include site number, test pit number, depth, description of geology and date of photograph. In addition, a geologic description of each photograph will be entered in the log book. All photographs will be indexed and maintained for future reference.

2.8 Record Keeping for Field Activities

This section describes the types of records to be maintained for all subsurface investigation activities. The Field Geologist or Engineer will maintain the following field records:

- o Material Classification logs
- o Field Logbook
- o Daily Drilling Record

Documentation of specific types of environmental samples, including chain-of-custody records is discussed in the A-E QCP.

2.8.1 Material Classification Logs (Boring Logs)

Material classification logs will be kept for each borehole, test pit, or excavation to provide a record of drilling and sampling methods, and to characterize subsurface materials. The log will include the name of the subcontractor and driller; makes and types of equipment used; dates and times of drilling; dimensions and depths of borings and casing; penetration data for samples; data on rock coring; rock, soil and fill material descriptions and classification; observations of

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unusual drill tool behavior; dates, times, and depths of groundwater observations; and air quality (PID, FID) monitoring results.

Soil samples will be classified using the Unified Soil Classification System (USCS) and described according to ASTM Test Designation D2488-84: Standard Practice for Description and Identification of Soils. The logs will show the depths at which material changes occur and will identify samples retained for laboratory analyses. All samples will be numbered and cross-referenced with the chain-of-custody record.

Field Descriptions should include the following visual properties:

- Color
- Grain size
- Gradation
- Plasticity
- Soil/Rock mass properties
- Consistency/Compactness/Hardness
- Soil/Rock Type and Secondary Components
- Moisture Condition

Water level readings are to be taken at the beginning and end of each work day as the hole is advanced. Water levels will also taken at completion (zero-hour reading) of drilling prior to sealing the borehole. Additional comments to be noted included caving or sloughing of the auger hole or excavation, difficulty in augering or penetration, and details with respect to depth of water including suspected artesian conditions. Table 2-2 contains a list of descriptive terms used for classification of soil samples.

TABLE 2-2
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Definition of Terms Used to Describe Subsurface Materials

I. SOIL TERMS

A. Grain Size

Size Fraction	Subcategory	Dimensions (mm)
o Boulder		> 12 inch
o Cobbles		> 76.2 (3 inch)-12 inch
o Gravel	Coarse	76.2 - 19.1
	Fine	19.1 - 4.76 (#4 mesh)
o Sand	Coarse	4.76 - 2.0
	Medium	2.0 - 0.42
	Fine	0.42 - 0.074 (#200 mesh)
o Silt	(Non-plastic/ granular)	0.074 - 0.005
o Clay	(Plastic/ cohesive)	< 0.005

B. Moisture Condition

o Dry:	Absence of moisture, dusty, dry to the touch, cohesive soils generally hard.
o Moist:	Damp but no visible water, cohesive soils deform with moderate effort.
o Very Moist:	Soil is damp and contains appreciable water, cohesive soils pliable.
o Wet:	Soil is completely saturated and may be dripping, cohesive soils soft to very soft.

C. Consistency

Granular Soils Term	Blows per Foot, N
o Very Loose	0 - 4
o Loose	5 - 10
o Medium Dense	11 - 30
o Dense	31 - 50
o Very Dense	Over 50

Cohesive Soils Term		Blows per Foot, N	Field Identification
o Very Soft	(<0.25 TSF)	<2	penetrated several inches by fist
o Soft	(<0.5 TSF)	3 - 5	penetrated several inches by thumb
o Medium Stiff	(<1.0 TSF)	6 - 15	penetrated several inches with moderate effort
o Stiff	(<2 TSF)	16 - 25	indented by thumb with great effort
o Very Stiff	(<4 TSF)	25 - 50	indented by thumbnail
o Hard	(>4 TSF)	>50	Indented with difficulty by thumbnail

NOTE: Large particles in the soils will often significantly influence the blows per foot recorded during the Penetration Test.

D. Textural Class Description

Textural classification of a soil is determined based on the distribution of grain size fractions. The portions be weight of each soil fraction is commonly used as the basis for determining textural class as follows:

- o Primary component: >35% grain size fraction
- o Secondary component: 15 - 35% grain size fraction

Example: Sample w/ 60% fine sand and 25% silt, described as Silty Fine Sand

Modifying Terms:

AND	Indicates approximately equal amounts of materials, such as a sand and gravel mixture. If the materials occur in thin separate seams, it is noted in the detailed work classification. The thickness is given where possible. Example: Medium dense sand and gravel, or dense interbedded coarse sand and gravel (1/4" - 3/4") thick
SOME	Indicates a significant amount (10-25%) of the accessory material. Example: Medium dense silty sand - some gravel
TRACE	Indicates a minor amount (<10%) of the accessory material. Example: Loose silty sand - trace of gravel
INTERBEDDED	Used to describe thin alternating seams. Thickness is given where possible. Example: Stiff interbedded silt and clay (approx. 1/16" thick)
POORLY GRADED	Indicates coarse grain soil that has a predominant grain size. Example: Poorly graded fine sand, trace silt
WELL GRADED	Indicates coarse grain soil that has a wide range of grain sizes. Example: Well graded silty sand, some fine gravel (15-20%)

E. Mass Structure

Term	Characteristic
Layer	Soil unit more than 6" thick.
Seam	Soil unit less than 6" thick.
Parting	Soil unit less than 1/8" thick.
Stratified	Alternating seams of varying material with layers greater than 1/8" thick.
Laminated	Alternating lamina of varying soil with layers less than 1/8" thick.

II. ROCK TERMS

A. Sedimentary Rock Classification

Rock Type	Characteristics
Sandstone	Made up predominantly of granular material ranging between 1/16 and 2mm in diameter.
Siltstone	Made up of granular materials less than 1/16mm in diameter. Fractures irregularly. Medium thick to thick bedded.
Claystone	Very fine grained rock made up of clay materials. Fractures irregularly. Very smooth to touch. Generally has irregularly spaced pitting on surface of drilled cores.
Shale	A fissile very fine grained rock. Fractures along bedding planes.
Limestone	Rock made up predominantly of calcite (CA CO_3) effervesces upon the application of hydrochloric acid.
Coal	Rock consisting mainly of organic remains.

B. Modifying Terms

SEAM	Thin (12 inches or less), probably continuous layer
SOME	Indicates significant (15 to 40 percent) amounts of the accessory material. Example: Rock composed of sandstone (70%) and seams of shale (30%) would be: sandstone, some shale seams
FEW	Indicates minor (0-15 percent) amounts of the accessory material. Example: Rock composed of sandstone (90%) and seams of shale (10%) would be: sandstone, few shale seams
INTERBEDDED	Used to indicate thin or very thin alternating seams of material occurring in approximately equal amounts. Example: Rock composed of sandstone (50%) and shale (50%) seams would be interbedded sandstone and shale

C. Hardness

Term	Definition
Soft	Scratched by fingernail
Medium Hard	Scratched easily by knife
Hard	Scratched with difficulty by penknife
Very Hard	Cannot be scratched by penknife

D. Brokenness

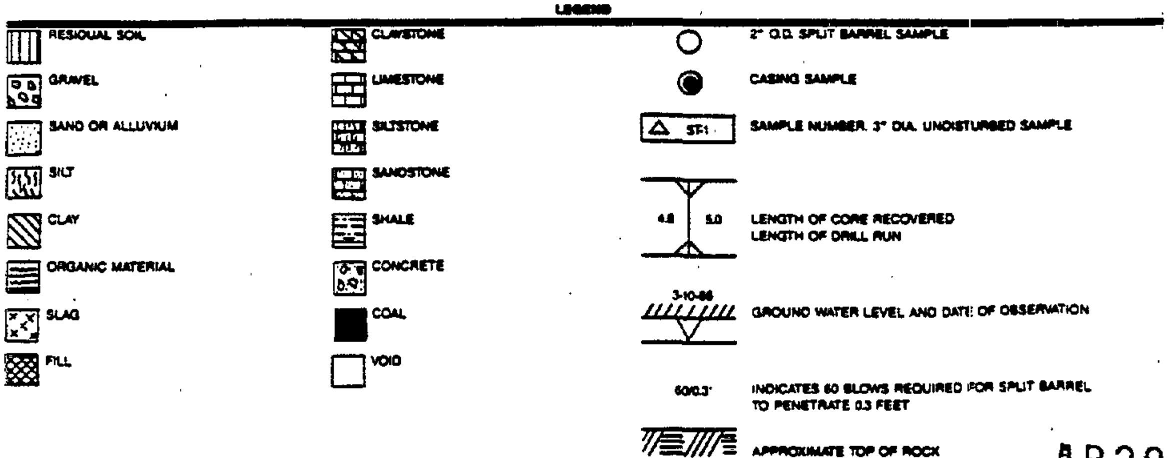
Terms		Spacing
Very Broken	(V.BR.)	Less than 2 inches
Broken	(BR.)	2 inches - 1 foot
Blocky	(BL.)	1 foot - 3 feet
Massive	(M.)	3 feet - 10 feet

E. Bedding

Term		Dimensions
Very thin	Natural breaks in Rock Layers	<1"
Thin bedded		1" - 4"
Bedded		4" - 12"
Thick bedded		12" - 36"
Massive		>36"

RQD - Rock Quality Designation is cumulative length of pieces of core equal to or greater than four inches in length divided by the total length of core run, express as a percentage.

LEGEND



AR300201

2.8.2 Field Log book

A permanently bound, waterproof field log book with pre-numbered pages will be maintained by the Field Geologist to document all field activities. This project-specific log book will contain a daily, chronological record of work in progress and will provide specifics on individual responsibilities and sampling activities, departures from established work plan tasks, field measurements, and other site-specific data. Log book entries should include:

- The names of field investigators and drilling personnel conducting work on site and any significant developments or problems encountered
- The start and completion dates/times of individual drilling activities (soil borings)
- The location, date, time, type, identification number, depth, collection and preservation methods, and schedule of analytical parameters for each sample collection for laboratory analysis
- The locations, dates, and times of activities related to measuring fluid levels, well purging, and field parameters
- Any significant non-drilling activities
- Record of site visitors

Log book entries will be made with waterproof ink. Corrections to log book entries will be made by drawing a single line through the incorrect entry, entering the correct information, and initialing and dating the change.

2.8.3 Daily Drilling Record

A daily record of drilling quantities and progress will be maintained to document subcontractor performance. This record will identify drill location; equipment and methods used; equipment mobilized or demobilized; record of footage; number and types of samples collected; record of materials used; maintenance and repair items; and standby and authorized downtime.

If personal protective equipment is used, the level of protection employed and types of materials used are to be recorded. The form is to be maintained by the Consultant's Onsite Coordinator and signed daily by the Contractor's representative. The daily drilling record form is presented in Figure 2-8.

In addition to the Daily Drilling Record, an A-E Daily Quality Control Report will be completed (Figure 2-9). The DQC will detail the days activities, weather conditions, problems, and corrective actions. The DQC reports will be submitted to the contracting officer on a weekly basis.

2.9 Equipment Decontamination

All instruments, devices, or equipment (including drilling equipment and tools) which are introduced into borings or make contact with wastes or other potentially contaminated materials will be decontaminated between uses to minimize the possibility of offsite spreading or transferring of hazardous waste.

Whenever possible, disposable equipment will be used. Decontamination procedures for cleaning sampling equipment used to secure samples for analytical purposes are described below:

AR300203

DAILY DRILLING RECORD			URS CONSULTANTS, INC.
Project: Client:			Date: Contractor:
From	To	Productive Hrs.	Activity/Comments
Total Productive Hrs.			Level B / Level C / Level D (circle selection)

Labor:		Materials/Supplies:	
Units	Activity	Units	Item
Weather:			
URS On-Site Coordinator		Contractor Representative	

AR300204

A-3131

URS CONSULTANTS, INC.

DAILY DRILLING RECORD

FIGURE 2-8

URS Consultants, Inc.
Daily Quality Control Report

Date: ______________ Weather: ______________

Work Performed: ______________

Sampling Performed: ______________

Field Analysis: ______________

Problems\Corrective Actions: ______________

Quality Control Activities: ______________

Printed Name: ______________ Signed Name: ______________

AR300205

URS CONSULTANTS, INC.	DAILY QUALITY CONTROL REPORT	FIGURE 2-9

A-3091

ORIGINAL (Red)

- Disassemble sampling tool, remove gross contamination, and move to clean, plastic-lined, decontamination area.

- Scrub equipment using phosphate-free, laboratory-grade detergent and water.

- Rinse thoroughly with water and check for visual signs of remaining contamination.

- Rinse with pesticide grade methanol.

- Rinse with distilled water.

- Allow to air dry on uncontaminated surface.

- Assemble and wrap in pre-cleaned aluminum foil if not immediately required for use.

All water for drilling, steam cleaning, and decontamination purposes, will be potable water obtained form the nearest fire hydrant.

Prior to entering or leaving the site, and before initiating drilling at each borehole, the rig, augers and all drill tools will be thoroughly cleaned by steam cleaning and scrubbing (if necessary), with a low-phosphate detergent and potable water. Equipment will be cleaned on the existing decontamination pad using a high-pressure steam jenny with a soap tank and potable water from a water truck. All waste materials and trash from the drilling operation, including spent cleaning solutions, rinse waters and disposable personal protection equipment, will be contained and stored on site.

AR300206

ORIGINAL (Red)

2.10 Collection, Testing and Disposal of Potentially Hazardous Materials

All drill cuttings and decon water will be drummed at the borehole location and staged at a secure location on site. Dissimilar types of potentially contaminated materials (i.e., soil, Tyvek-wear, water, etc.) shall be segregated into individual drums properly labeled as to content, and stored at a designated location on site. Materials will be placed in USDOT- or USEPA-approved drums and secured pending receipt of analytical results. Samples for material classification for disposal will be taken at a frequency of 1 composite sample per every 10 drums. Composite samples will be formed by combining representative drum samples obtained using a soil probe. Characterization parameters for waste materials generated during the investigation are given in Table 2-1. It is understood that URS will not be responsible for manifesting the drummed material or transporting it off site. URS will, however, determine the optimal method for disposal, and will furnish an estimated disposal cost to the contracting officer.

AR300207

3.0 ANALYTICAL/STATISTICAL CONTROL PARAMETERS

The purpose of quality control (QC) procedures and documentation is to ensure that the analytical systems are operating within needed limits of accuracy and precision, and that the conditions of control are properly documented. Results of QC tests may also be used to estimate bias and precision associated with analytical results. Goals for data quality assessment for the analytical laboratory are described in the A-E Quality Control Plan.

ORIGINAL (Red)

4.0 SOIL/WASTE ANALYTICAL REQUIREMENTS

The environmental samples collected during the pre-design remediation of DS&G will be analyzed in accordance with the USEPA methodologies presented in the A-E Quality Control Plan. Volatile organics, Base/Neutral/Acid extractable organics, Pesticide/PCBs, and Total Metals will be analyzed for the Target Compound List (TCL) and Target Analyte List (TAL) parameters given in USEPA's Contract Laboratory Program (CLP).

4.1 Method Detection Limits

Method Detection Limits are discussed in the A-E Quality Control Plan.

4.2 Waste Compatibility Testing

Compatibility tests will be performed on soil and waste samples obtained at the locations described in subsection 2.5.1. The purpose of this testing is to determine the compatibility of the different waste types with each other prior to chemical analysis. Compatibility testing procedures are described in the A-E QCP.

ORIGINAL (Red)

5.0 CALIBRATION OF EQUIPMENT

5.1 Laboratory Instrument Calibration

Laboratory instrument calibration procedures are discussed in the A-E LQMP.

5.2 Calibration of Field Equipment

A. Organic Vapor Detectors: Air and soil will be screened for volatile organics using a portable photoionization detector (PID), and organic vapor analyzer (OVA) equipped with a flame ionization detector. While the PID/OVA will not identify or quantify individual compounds, it can be standardized and used to quantify relative differences between samples for total aromatic vapors present. The instrument will be calibrated daily (prior to field activities) and the results will be recorded in the field log book. The instruments will be calibrated to both a benzene and naphthalene surrogate. This will enable field screening for volatile and polynuclear aromatic compounds.

B. Radiation Survey Meter: An instrument operational check will be performed prior to each use by exposing the detector to a known source and confirming a proper reading on each scale.

C. Explosimeter: Once a day the explosimeter will be calibrated to a methane gas standard. Prior to each use, the oxygen sensor will be air-calibrated at an upwind location. This calibration involves adjusting the meter to read 20.5%, the concentration of oxygen in ambient air.

Additional information on field equipment calibration procedures are presented in the A-E QCP.

AR300210

ORIGINAL (Red)

SECTION 6.0 - TRENCH BORING PROGRAM
(SAMPLING PLAN ADDENDUM I)

6.1 Project Description

6.1.1 Purpose

In July, 1990 a Pre-Design Investigation was initiated at Delaware Sand and Gravel, a Superfund site containing buried drums. The site is located in New Castle, Delaware, a suburb south of Wilmington (see Vicinity Map, Figure 6-1). Because of the density and condition of the drums found on the perimeter of the drum disposal area, plans to drill borings in the interior of the disposal area were canceled.

As a result, a second phase of field investigations under Modification No. 002, will be conducted at the Delaware Sand and Gravel site to obtain soil and waste samples for thermal treatability testing and to further characterize the condition of buried drums, compatibility of containerized materials, and extent of chemical contamination beneath the disposal area. Specific details of this program are described in the following sections.

6.1.2 Scope of Work

URS will excavate two trenches in locations as shown in Figure 6-4. Each trench will be approximately 15 to 30 feet in length and about 15 feet in depth. Trench length is dependent upon, and limited to, the removal of approximately 50 intact or leaking drums at each trench location.

All intact drums and drums containing unstable or leaking wastes that are encountered during the excavation of these trenches will be overpacked, sampled, characterized for compatibility, segregated, and placed into rolloff containers for onsite storage. Empty or crushed drums, and crushed or broken drums that are not leaking wastes, will be placed back into the trench in a location which precludes interference with boring activities. The overpack containers will stay onsite in rolloff containers stored within

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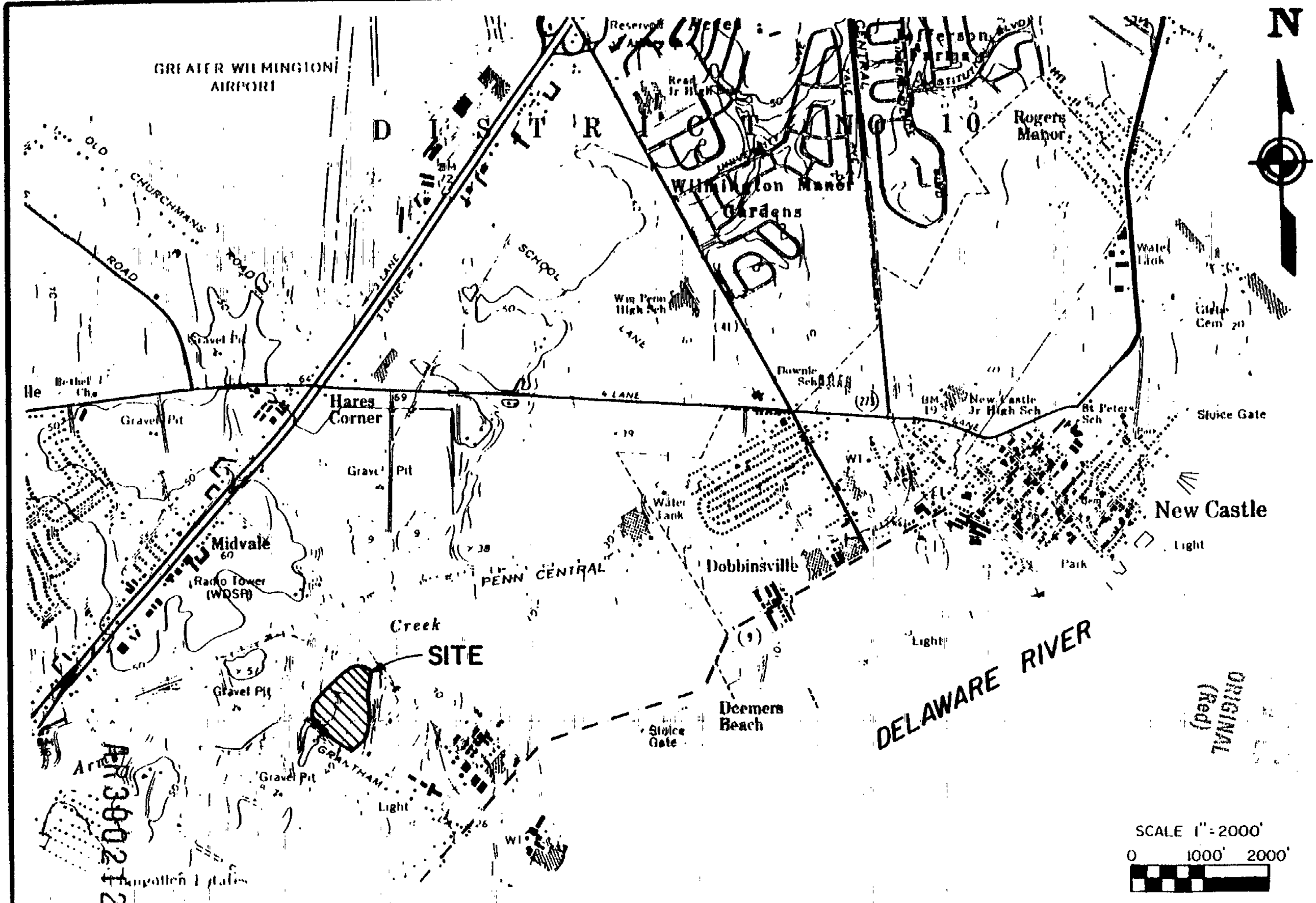

URS CONSULTANTS INC

DELAWARE SAND & GRAVEL
SITE LOCATION MAP

FIGURE 6-1

AR300212

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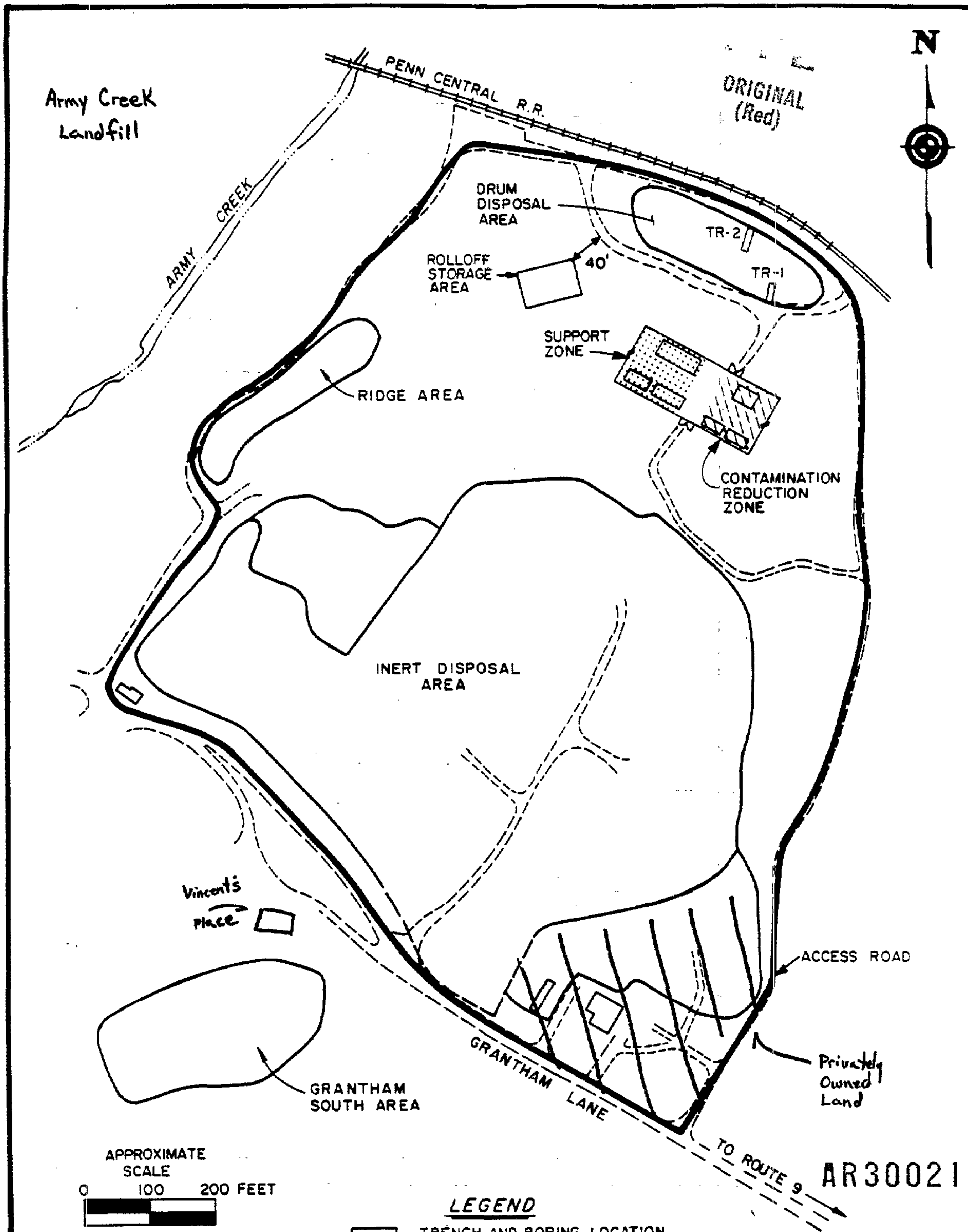

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URS CONSULTANTS, INC.	DS+G SITE MAP	FIGURE 6-2

A-3085

ORIGINAL (Red)

a fenced compound containing a concrete pad until the site remediation phase. A maximum of 100 drums will be overpacked and stored. In the event that drums are present in higher drum densities than estimated, trench length may be limited to less than 15 feet.

An area of approximately 3,200 square feet will be cleared and grubbed for the placement of the drum rolloff storage pad and a staging area for drums awaiting characterization. The rolloff storage area concrete pad will consist of 6" poured concrete over a 6 x 6 wire mesh with an integral liner and 1 ton of rebar. The storage pad will have 18" curbs and will be sloped to drain towards a 3' x 4' x 2' collection sump. A chain link fence complete with gate and 5 foot entrance ramp will be installed around the rolloff storage area (see Site Map, Figure 6-2).

Air monitoring of the area will be performed during trenching operations as per the SHERP Revision II, December 1990. A truck equipped with foam spreading equipment will be provided during trenching operations to afford, if needed, onsite vapor or fire suppression capability.

Characterization of drum contents for waste compatibility will take place in an on-site compatibility laboratory prior to storage by compatibility classification. The compatibility laboratory will also characterize boring samples and waste material from the trenches for preparation of treatability composites.

Upon completion of trenching operations, the trenches will be backfilled, and two vertical borings, will be extended to a vertical depth of about 40 feet, or until the clay confining later is encountered. The boring will be located as close as practical to the end of the respective trenches, nearest to the center of the drum disposal area, as shown in Figure 6-4. Representative waste samples from the trenches and soil samples from the borings will be characterized, and composites of this waste and underlying soil will be provided for treatability testing.

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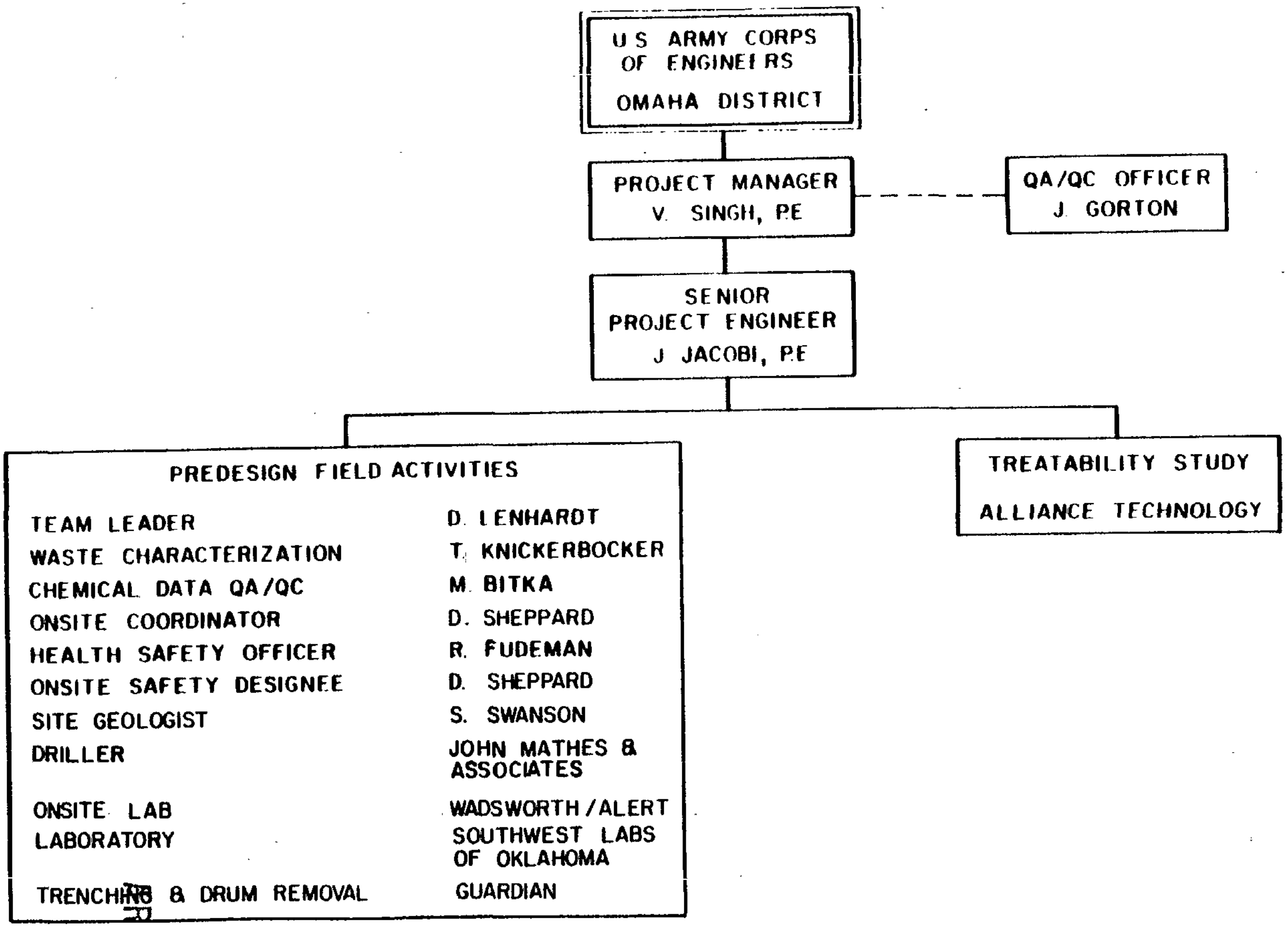

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URS CONSULTANTS, INC.

PROJECT ORGANIZATION CHART

FIGURE 6-3

ORIGINAL (Red)

6.1.3 Project Organization

The URS project team for site activities is being augmented by three subcontractors: Guardian, who will be performing clearing and grubbing and construction of the drum storage area, trenching, drum overpacking and sampling; John Mathes & Associates, who is performing drilling operations; and Wadsworth Alert, who will be performing compatibility sampling (see Project Organization Chart, Figure 6-3).

URS Consultants will provide a site coordinator, a field geologist, a sampling coordinator, and an air monitoring technician. The air monitoring technician will also have responsibility for providing and monitoring air supply to URS personnel during the field program.

Guardian personnel will include a site supervisor, equipment operator, and four clean-up technicians, of which one will be a sampling specialist, and another qualified in protective equipment and air supply procedures.

John Mathes & Associates will supply a crew of three while drilling two borings. This crew includes a driller and two helpers, one of which will implement contractor's air supply.

Wadsworth Alert will supply a crew of two people: a chemist and a technician.

6.2 Field Activities, Sampling, and Storage

6.2.1 Trenching, Drum Removal, and Storage

Guardian will use a rubber-tired Komatsu IT-28 bucket excavator and a track-mounted hop-toe equipped with a Labonty drum grappler attachment during trenching excavation. Two trenches will be excavated. Each trench will be excavated to a minimum width of three feet, and to a depth sufficient to ensure that all buried drums have been removed from the trench

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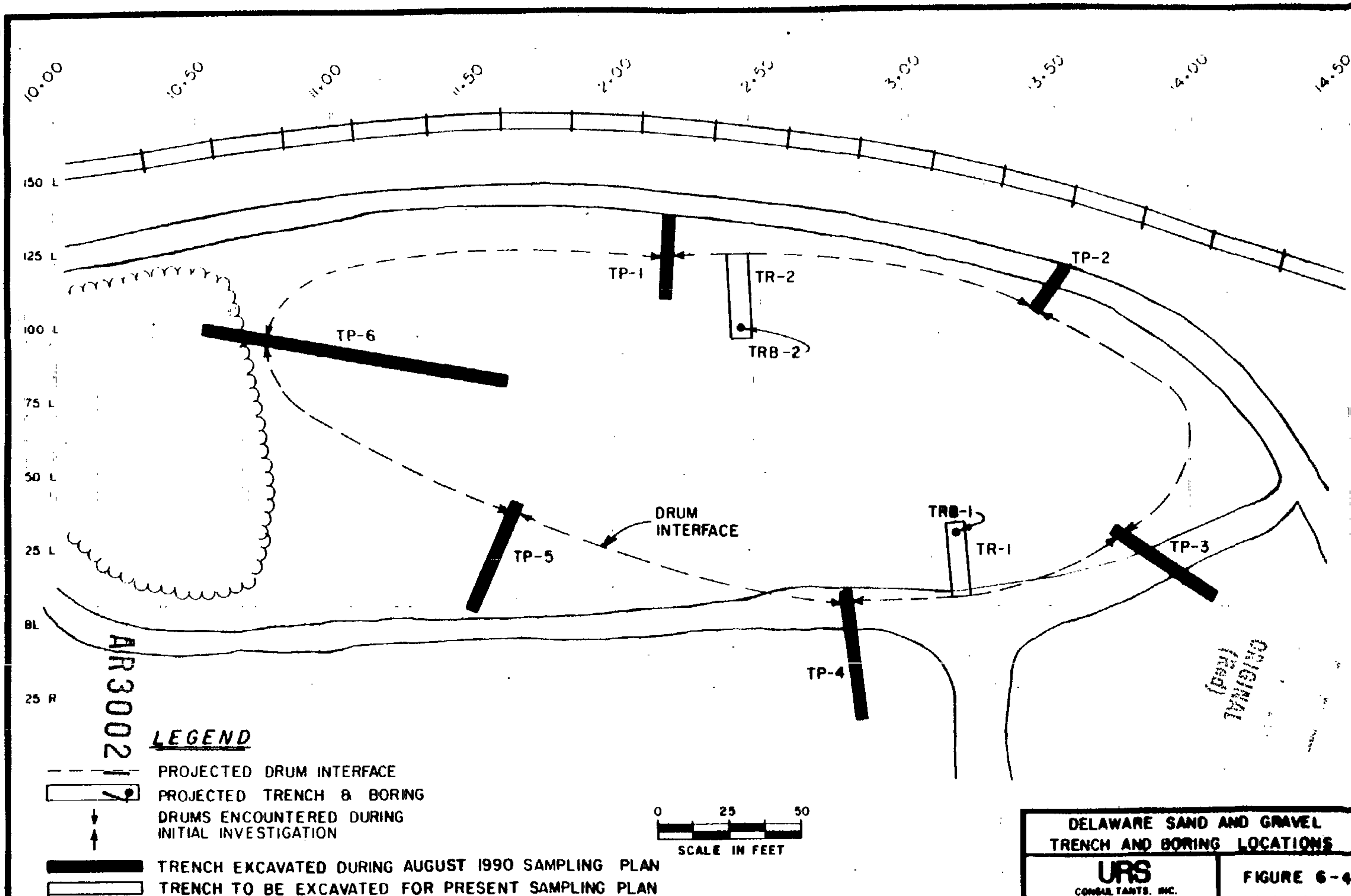

DELAWARE SAND AND GRAVEL
TRENCH AND BORING LOCATIONS

URS CONSULTANTS, INC.

FIGURE 6-4

AR300217

ORIGINAL (Red)

(estimated to be about 15 feet in depth). Each trench is to be extended for an estimated 10 to 30 feet, or until 50 intact or leaking drums have been overpacked. The attachments of the heavy equipment have a depth range of 20 feet. Trench locations are shown on Figure 6-4.

A trench box fabricated by Guardian will be used to conduct the excavations to minimize side-wall collapse. The trench box is 16 feet high and 10 feet long with adjustable widths to accommodate the bucket excavations and drum grappler. The bucket excavator, equipped with a landscaping blade, will remove the soil in 1/2 to 1 foot lifts or until encountering drums by visual inspection. Upon discovery of a drum or drums, the drum grappler will be used after enough surrounding soil is removed. The drum grappler will be used to delicately dislodge and remove each drum. Special care will be implemented to minimize leaks or spillage. Spill containment will be provided through the use of absorbant sheets, pillows and booms during excavation, overpacking and storage of drums. The trench box will be moved as the excavation goes deeper to accommodate a trench depth of 16 feet deep.

During trench excavation, samples will be collected from the material around the drums. Each discrete sample will be collected into a 1-gallon, wide-mouth plastic container using a disposable scoop and obtaining the sample out of the bucket of the backhoe. These samples will be given an alpha-numeric code corresponding with the length and depth of the trench. The discrete samples will be collected in 5-foot intervals. For example, if the test trench is 15 feet in length by 15 feet in depth, the sample collected in the first 5-foot length and 5-foot depth would be coded as TR1-5'Lx5'D. The second sample collected would be 5-foot length and 10-foot depth and coded as TR1-5'Lx10'D where:

TR - Test trench
1 - Test trench #1
5'L - 5-foot length
5'D - 5-foot depth
10'D - 10-foot depth

ORIGINAL (Red)

When the trench excavation is complete, sample will be collected from the bottom of the trench in a 1 gallon wide-mouth plastic container . The sample will be collected using a disposable scoop and obtaining the sample out of the bucket of the backhoe. This sample will be stored onsite and used, if necessary, to augment the soil boring composite as discribed in Section 6.2.4.

The discrete samples will be composited in the field after the compatibility testing. Discrete samples that are not compatible will not be used in the composite samples. A composite will be made by combining equal volumes of discrete samples into a 30-gallon container and mixing until homogeneous. This compositing scheme will take place on the decon pad. A 10' x 10' sheet of plastic will be placed under the work area to control spills and splashing. The above sampling and compositing protocol will ensure that a sufficient volume of sample is obtained for analysis (15 liters). The number of samples and analytical requirements can be found in Section 6.3, Sample Summary.

Drum debris and crushed, empty drums will be stockpiled and placed back in the trench in an area located to preclude interference with later boring operations. Drums containing waste will be sampled. After sampling, those drums containing waste will be placed in 85 gallon steel overpack containers and placed on a 500 square foot 24-hour staging pad. Upon characterization from the onsite laboratory, the overpacks will be labeled and placed in appropriate rolloff containers. The rolloff containers will be staged on a 2,700 square foot concrete storage pad. There will be seven (7) rolloff containers and they will be segregated as follows:

Flammable - sample pops or flames briefly, sample sustains flame

Oxidizers - as per Appendix B in the Sampling Plan

Reducers - as per Appendix B in the Sampling Plan

Air/Water Reactive - foaming or bubbling, color change, evolution of gas, temperature change

AR300219

Corrosive (pH <7) - if the pH is 2-7 or <2 and does not classify as

ORIGINAL (Red)

Flammable, Oxidizers, Reducer or Air/Water Reactive

Corrosive (pH >7) - if the pH is 7-12 or <12 and does not classify as Flammable, Oxidizers, Reducer or Air/Water Reactive. Cyanide and sulfide bearing wastes will also be placed in this category
NOS (Not otherwise specified) - drummed wastes which do not fall into the above categories, i.e., dirt contaminated with motor oil

In the event that the majority of drummed wastes fall into 1 or 2 categories, the rolloff containers will be labeled appropriately. The rolloff containers will be covered when not in use.

6.2.2 Drum and Waste Sampling Procedure

Guardian personnel will sample drums containing waste and turn over sampled containers to a URS sampling technician for appropriate labeling and transfer for characterization and analyses. Guardian will prepare a log sheet for each drum which will include an alpha-numeric code, a description of the drum, date, time, location of drum, its condition, type of contents, and any pertinent or legible information on the exterior. All drum samples will be logged into a sample register by Guardian personnel.

Drums containing liquid waste will be sampled using a dedicated glass drum thief. Sealed, intact drums will be opened with a non-sparking saw or brass punch. If a drum is expanded or bulging, a punch will be mounted on an arm of the excavator. Using an explosion shield, a small hole will be punched with the extended arm, large enough to extract a sample of the contents. Solids or sludges will be sampled using dedicated scoops.

After sampling, each drum will be placed in an overpack steel container and placed on the 24-hour staging pad, until contents are characterized. Once characterized, a hazardous waste label containing the proper DOT shipping name, UN or NA number, generator information, EPA ID and waste number, and the date will be applied to the drum. The drums will then be placed in the appropriate rolloff container as described in Section 6.2.1 above.

AR300220

6.2.3 Soil Borings

Natural soil beneath the trenches will be characterized by drilling two (2) soil borings, one at each trench location (Figure 6-4). Each boring will be placed near the innermost reach of each trench (within 5 feet of the existing face of drums), to sample the soils beneath the buried drums. In order to accommodate drilling, that portion of the trench where drilling is to occur will be backfilled with soil. The remainder of the trench will be backfilled with waste removed during excavation. Metal debris such as empty, non-leaking crushed, or fragments of drums will be placed back in the trench so as not to interfere with the placement of the vertical auger boring. Backfilled soil will be compacted as necessary to avoid excessive settlement and to accommodate the movement of the drill rig.

Borings will be advanced through soils using 4-1/4-inch I.D., hollow stem augers. The equipment and procedures will be the same as those used during previous field activities (July 1990). Drilling procedures are outlined in Section 2.6.1 of the Sampling Plan (URS, 7/90 - Revised).

6.2.4 Soil Boring Sampling

Split-spoon soil samples will be taken continuously beginning several feet above the estimated soil/waste contact as defined during trenching operations. A 3-inch O.D. stainless-steel sampler will be used in accordance with sampling procedures specified in Section 2.6.2 of the Sampling Plan (URS, 7/90 - Revised). All samples will be classified, logged, and coded following procedures described in Section 2.8 of the Sampling Plan.

Soil obtained from the respective borings will be used for analytical characterization, and for treatability testing. Samples for analytical characterization will be obtained at 5-foot intervals beginning with the first spoon sample to encounter undisturbed soil. All remaining soil will be submitted for onsite compatibility testing and subsequently mixed to form a single, representative composite. If sufficient sample volume is not obtained during drilling, the composite sample will be augmented with soil obtained previously from the bottom of the trench during trench excavation. The composite sample will be formed following compatibility testing using the method described in Section 6.2.1.

The total depth of each boring will be approximately 40 feet, corresponding to the projected encounter of the clay confining layer. Upon completion of each boring, a Portland Cement mixed grout will be used to seal the borehole as described in Section 2.6.4 of the Sampling Plan (URS, 7/90 - Revised). Soil cuttings will be containerized in drums and sealed using lids with gaskets. These drums will be stored on the rolloff storage pad at the completion of field activities.

6.2.5 Decon Procedures

Decontamination of equipment will be performed as described in Section 2.9 of the Sampling Plan (URS, 7/90 - Revised).

6.2.6 Sample Summary

The samples to be collected and analyzed under modification No. P0002 of the predesign investigation at the Delaware Sand and Gravel site include 100 drummed waste samples collected from two (2) test trenches. These samples will be tested onsite for waste compatibility. Ten percent of these samples will be collected for duplicate analysis. During excavation activities, the material around the drums will be sampled, tested for compatibility, and then a composite will be made from the two (2) test trenches and submitted for analysis as per Table 6-1. After the trenching program is complete, a vertical borehole will be advanced into each test trench. Once the borehole is below the previously excavated depth, discrete samples will be collected at five foot intervals. There will be three (3) discrete samples collected from each borehole and these samples will be submitted for analysis as shown on Table 6-1. The remaining sample collected during the boring program will be taken for compatibility and composited for analyses as shown on Table 6-1. Two (2) samples will be

TABLE 6-1

SUMMARY OF REQUIRED SAMPLES (MOD. P00002)

Sample I.D.	No. of Samples	No. of Duplicates	No. of MS/MSD	USACE Samples	Total	Analytical Schedule[1]
Drum Samples	100	10	--	--	110	(2)
Discrete Trench Samples	18	2	--	--	20	(2)
Discrete Boring Samples	6	1	--	--	7	(2)
Discrete Soil Borings	6	--	--	--	6	E
Soil Boring Composites	1	1	1	1	4	A
Test Trench Composites	1	1	1	1	4	A
Drill Cuttings	1	--	--	--	1	B
Decon Water	1	--	--	--	1	B
Treatability Study (Ash Samples)	18	2	2	2	24	C

(1) Analytical schedules are presented in Table 2-1A (URS Sampling Plan, 12/90 - Revised).

(2) Drum samples and discrete trench and boring samples are for compatibility testing only, see Appendix B of the Quality Control Plan.

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collected for RCRA characterization: one sample from the drill cuttings obtained during the borehole program, and one sample from the storage tank containing the decon water.

The two composite samples (boring and test trench) will be submitted for treatability analyses. These analyses will be conducted in accordance with the A-E Thermal Destruction Treatability Testing Study Plan. The number and analytical schedule for these samples are presented on Table 6-1.

The analytical and QC program for the above samples can be found on Table 6-1.

TABLE 2-1

FIELD SAMPLE CONTAINER, VOLUME, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Sample Type	Number Field Samples	A-E Lab QC Samples	USACE Lab QA Samples	Sample Parameters	Sample Volume	Container Type	Preservation Method	Holding Time
I) Thermal Treatability Testing Samples								
A) Soil Boring Samples	136	28	14					
B) Surface/Drum Waste Samples	20	4	2					
C) Soil/Waste Composite Samples	32	6	3					
				o Specific Gravity	1,000 ml	Wide mouth	Refrigerate	NA
				o Heat of Combustion	(4)	glass jar with	at 4°C	"
				o % Moisture	(4)	teflon lined	"	"
				o Flash Point	(4)	cap(1)	"	"
				o Viscosity	(4)	"	"	"
				o Ash	(4)	"	"	"
				o Particle Size	(4)	"	"	"
				o pH	(4)	"	"	"
				o Halogens (Br,F,I,Cl)	(4)	"	"	"
				o Volatiles	2-120 ml	"	"	14 days
				o Acid/Base/Neutral	500 ml(2)			14 days(3)
				Organics				30 days(5)
				o Dioxins & Furans	500 ml(2)	"	"	30 days(5)
				o Cyanide	250 ml	"	"	14 days
				o Sulfide	250 ml	"	"	7 days
				o Metals	500 ml	"	"	6 months (Hg-28 days)
				o PCBs	500 ml(2)	"	"	14 days(3)
II) Investigation Waste Samples								
A) Drill Cuttings	15	2	2					
B) Decon Water	5	1	1					
				o Ignitability	250 ml	Wide mouth	Refrigerate	NA
				o Corrosivity	500 ml	glass jar with	at 4°C	"
				o Reactivity	1,000 ml	teflon lined	"	"
				o TCLP	500 ml	cap(1)	"	"

Notes:

(1) Sample container must have zero headspace.
(2) 1-500 ml sample volume will be collected for the following analyses: Semivolatile Organics, PCBs, Dioxins, and Furans.
(3) Sample extraction within 14 days, analysis within 40 days of collection.
(4) 1-1,000 ml sample volume will be collected for the following analyses: Specific Gravity, Heat of Combustion, % Moisture, Flash point, Viscosity, Ash, Particle Size, pH, and Halogens.
(5) Sample extraction within 30 days, analysis within 45 days of collection.

ORIGINAL (Red)

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ORIGINAL (Red)

TABLE 1-1

ORGANIC COMPOUNDS OF CONCERN
DELAWARE SAND AND GRAVEL SITE

Compound	Highest Observed Soil Conc.* ppm (mg/kg)	Acceptable Soil Conc.* ppm (mg/kg)
Toluene (9)	1.900	6,000.
Methylene Chloride	0.72	0.62
Acetone (9)	4.4	77.0
4-Methyl-2Pentanone (9)	3.1	78.0
Ethylbenzene (9)	0.2	7,500
1,2-Dichloroethane	1.2	0.7
Xylene (9)	1.1	4.8
Phenol (9)	2.1	497.0
Bis(2-Chyloroethyl)Ether	0.18	0.004
Naphthalene (8)	4.2	4,300.
4-Methylphenol (9)	0.24	4,600
2-Methylphenol (9)	1.4	4,600.
2-Butanone	7.6	610

* Analytical values taken from Table 7 of the Record of Decision for the Delaware Sand and Gravel Site, 4-22-88.

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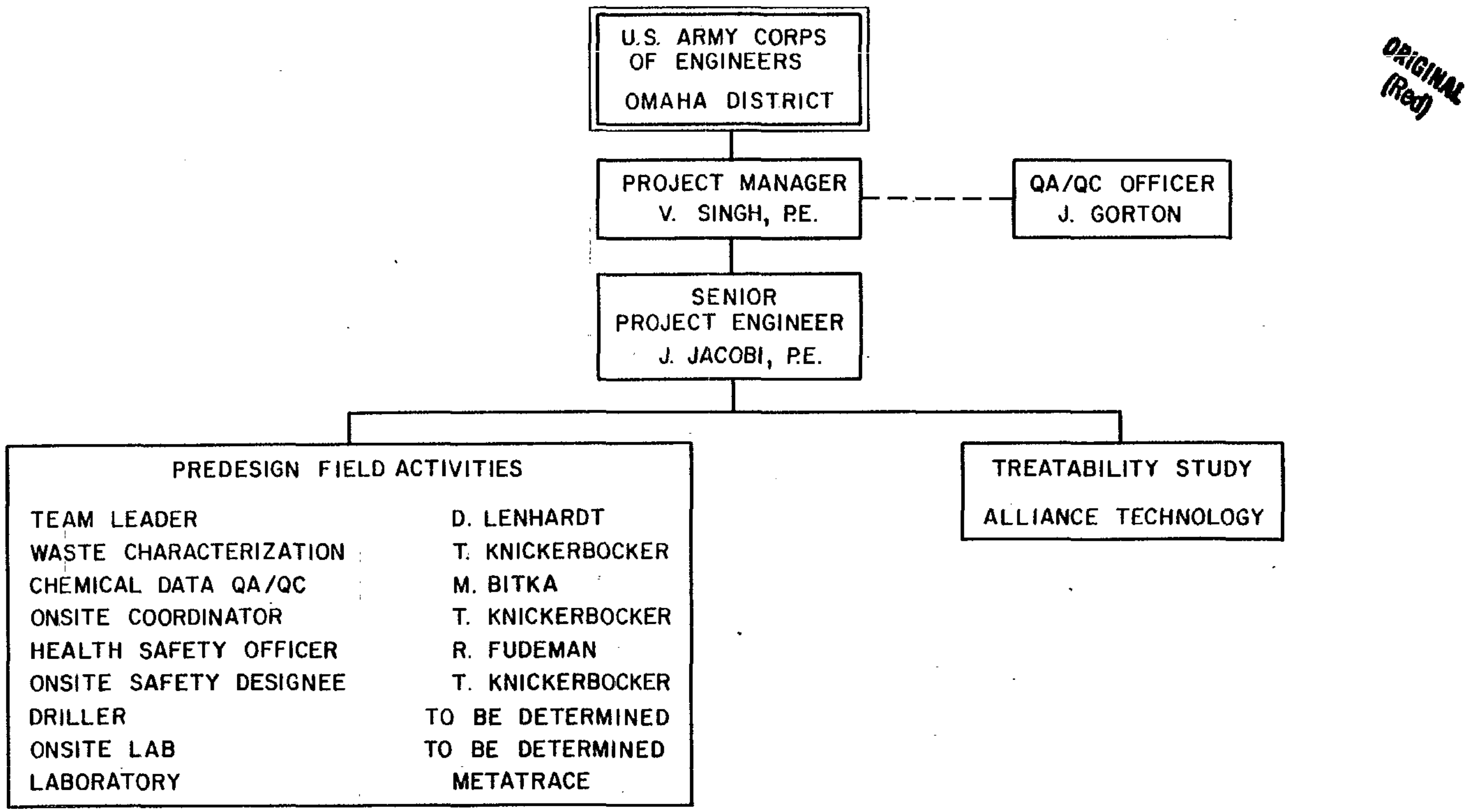

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FIGURE 1-2

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dichloroethane, xylene, phenol, bis (2-chlor-ethyl) ether, napthalene, 4-Methylphenol, 2-Methylphenol and 2-Butanone. Also, Columbia Formation samples generally have increased metals concentrations (chromium, lead, and nickel in DGC-4, DGC-6, DGC-8 and DGC-9). In general, the formation soil chemistry mimics the groundwater chemistry in extent and nature, indicating that contaminants are migrating with the groundwater and adsorbing onto the soil.

Table 1-1 is a list of organic compounds found at the site. The highest soil concentrations observed at the site are listed with corresponding acceptable cleanup levels as provided by the record of decision.

1.5 Project Organization

Project organization is shown in Figure 1-2. The chain of command in the event of a health/safety-related occurrence is found in the Safety, Health and Emergency Response Plan.

ORIGINAL (Red)

1.4 Contaminants of Concern

The following is a summary of the extent to which surface soils and formation soils, are contaminated at the site.

Surficial Soils

The analytical results for surficial soils on the Ridge Area indicate isolated "hot spots" with significant concentrations of organics and metals. Metals detected above background included arsenic, antimony, barium, copper and lead. The major organic detected was PCB's at concentrations from 97 ppb to 49,000 ppb.

Surficial soil contamination is not a concern at the Drum Disposal Area because of the USEPA cleanup action in 1984 which removed surface drums, and covered and revegetated the area.

Formation Soils

The analytical data for deep soil samples indicate that organic and metal contamination is emanating from the Drum Disposal Area. Organic compounds were detected in soil boring samples collected from:

1. The Drum Disposal Area proper (DGC-6);
2. The base of the Columbia Formation close to the Drum Disposal Area (DGC-4);
3. The uppermost Potomac silty clays beneath and adjacent to the Drum Disposal Area (DGC-4); and
4. The top portion of the upper Upper Potomac sands (DGC-6,DGC7, DGC-8).

Organic compounds detected in formation soils included, toluene, methylene chloride, Acetone, 4-Methyl-2 Pentanene, ethylbenzene, 1-2

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